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**DEVELOPMENT of a PREDICTIVE MODEL to
ASSESS the EFFECTS of EXTENDED SEASON
NAVIGATION on
GREAT LAKES CONNECTING WATERS**

AD-A202 197

APPENDIX A

Site and Soil Conditions



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Michigan Technological University

Houghton, Michigan

October 1985

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| 12. PERSONAL AUTHOR(S) Hodek, R.J., G.R. Alger, and H.S. Santeford | | | | | |
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| FIELD | GROUP | SUB-GROUP | St. Marys River System, Computer Model, Winter Navigation, Sediment Translocation, Water Quality, Structure Damage, Hydraulic Changes | | |
| | | | | | |
| | | | | | |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number) The object of this study was to develop a method for forecasting the physical effects of the passage of commercial vessels through Great Lakes connecting waters during that period of time when traffic is normally at a minimum due to a more or less continuous ice cover. The physical impacts examined were sediment translocation, water quality effects, direct damage to existing structures, and changes in the gross hydraulic regime. Also associated with Appendix A but bound separately are; Development of a Predictive Model to Assess the Effects of Extended Season Navigation on Great Lakes Connecting Waters, Final Report; the User's Manual for Prediction of Vessel Impacts in a Confined Waterway; Appendix B, Observed Vessel Induced Water Level Drawdowns; and Appendix C, Observed Ice Thicknesses and Water Turbidities. | | | | | |
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DEVELOPMENT OF A PREDICTIVE MODEL TO
ASSESS THE EFFECTS OF EXTENDED SEASON
NAVIGATION ON
GREAT LAKES CONNECTING WATERS

APPENDIX A
SITE AND SOIL CONDITIONS

by Ralph J. Hodek
George R. Alger
Henry S. Santeford

Submitted to the U.S. Army Cold Regions
Research and Engineering Laboratory
in partial fulfillment of
Contract No. DACA89-85-k-0001

Michigan Technological University
Houghton, Michigan

October 31, 1985

From 1473

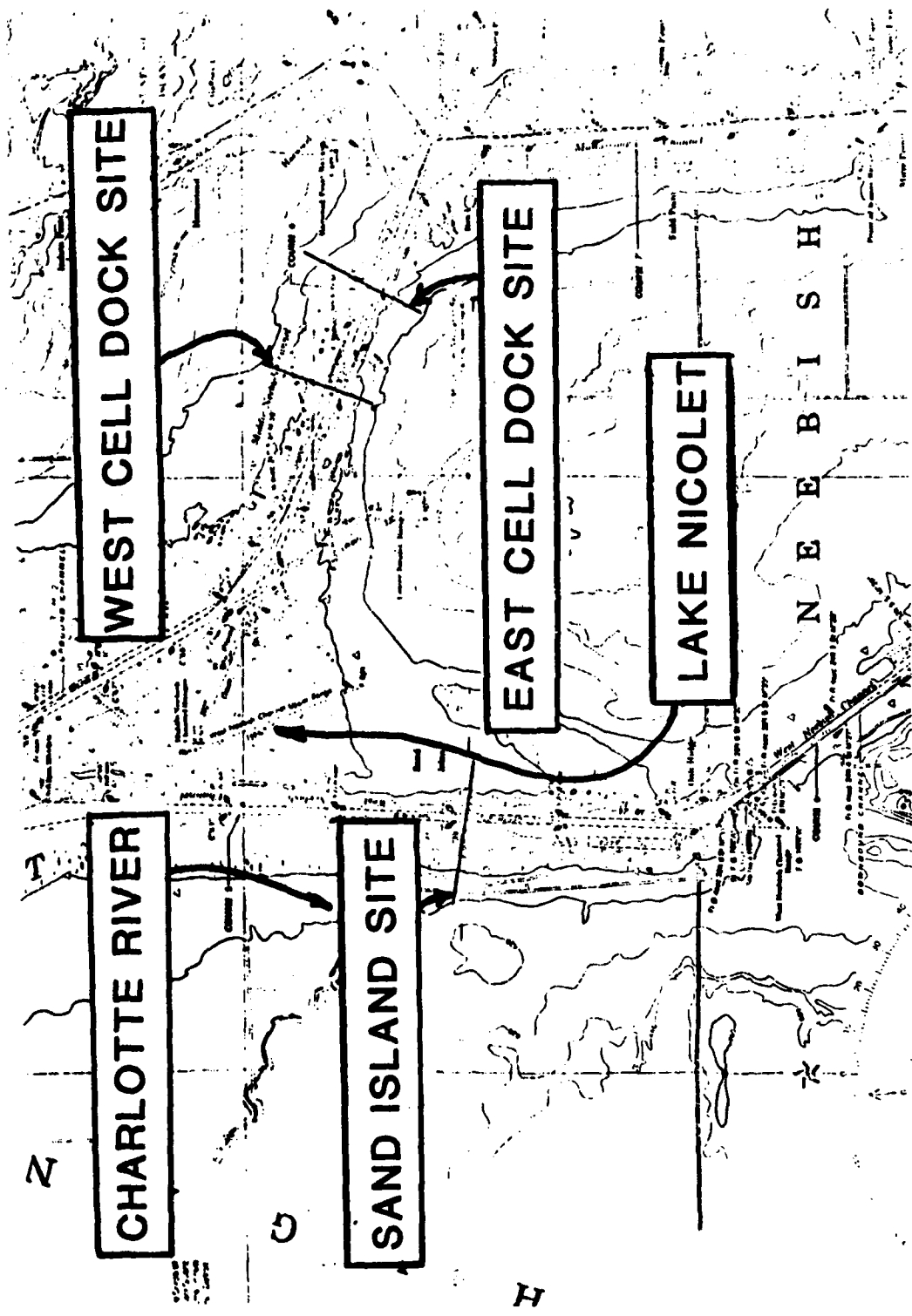
This appendix contains the general locations of all data gathering sites used along the St. Mary's River as shown on portions of NOAA Great Lakes chart 14883. The general site locations are followed by detailed data arranged by site.

Individual site data includes all soil data collected, detailed cross-section information as appropriate, and the specific locations of light extinction and turbidity data acquisition for the Lake Nicolet and Lake Munuscong sites. The light extinction and turbidity data are located in Appendix C. (CR)

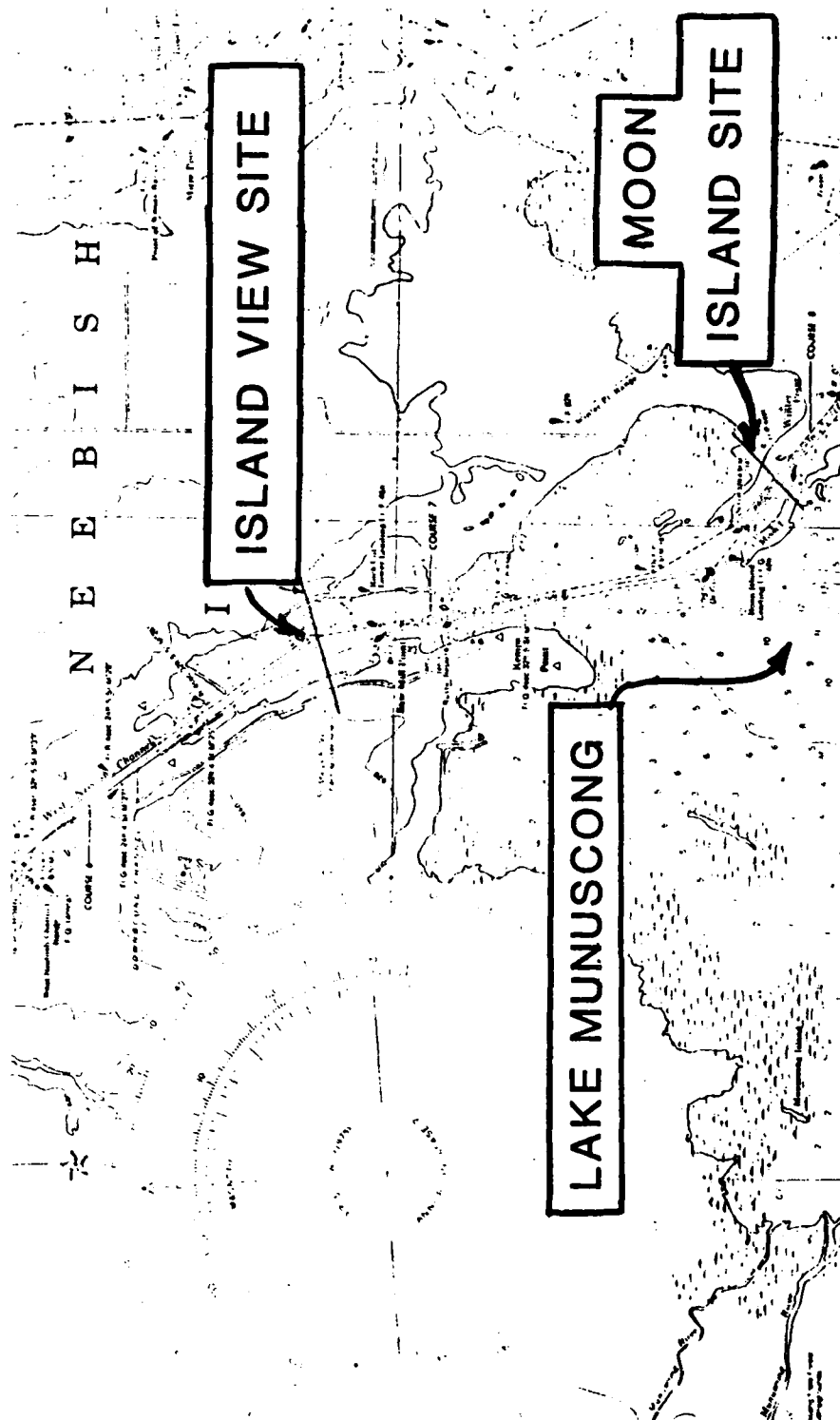
The "green side" or "red side" referred to in much of the data defines the side of the channel at which the data were collected. Facing upstream the red side is to the right and the green side is to the observer's or vessel's left.

| | |
|--------------------|-------------------------------------|
| Accession For | |
| NTIS GRA&I | <input checked="" type="checkbox"/> |
| DTIC TAB | <input type="checkbox"/> |
| Unannounced | <input type="checkbox"/> |
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| By _____ | |
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| Availability Codes | |
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| A-1 | |



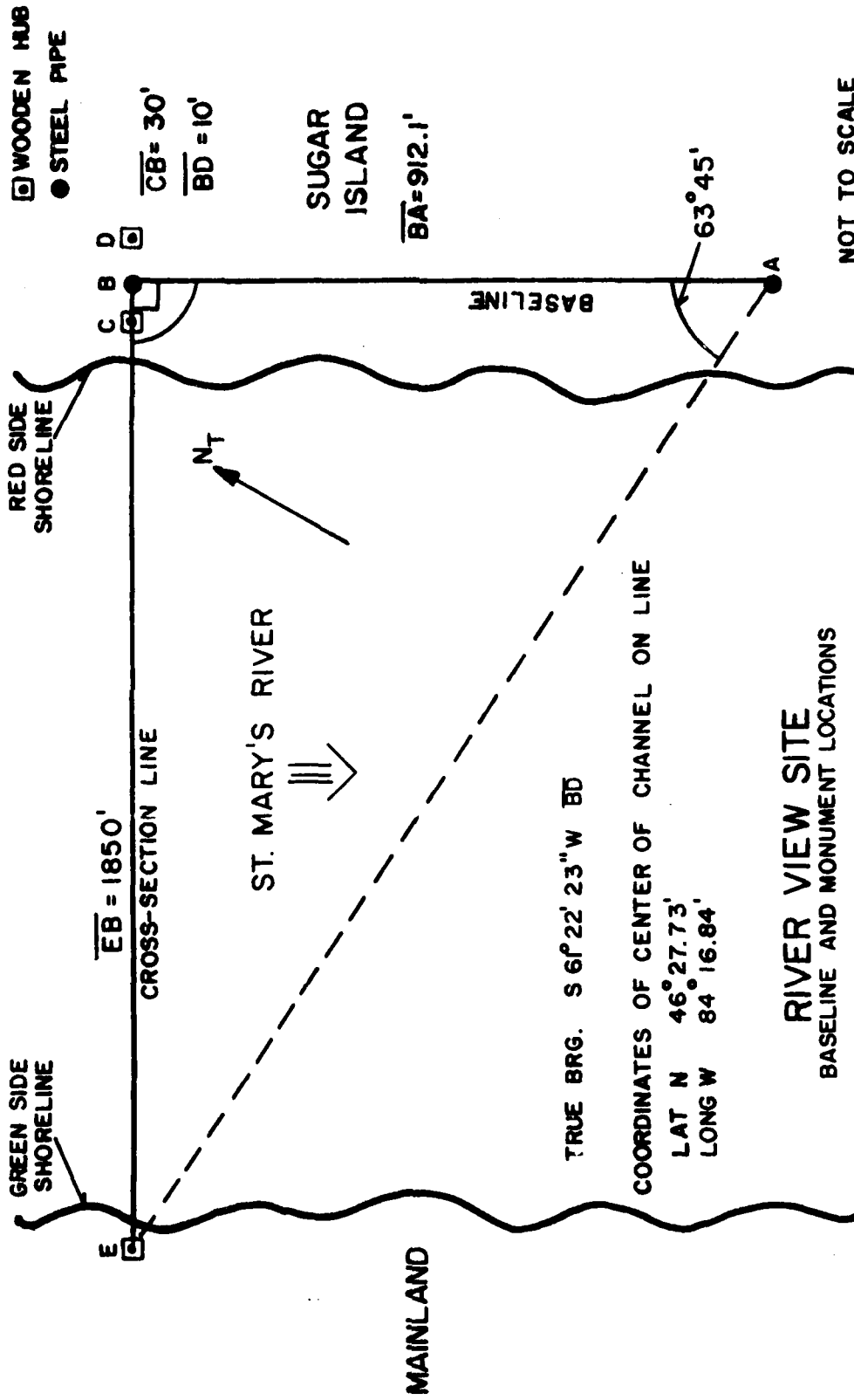


Site Locations in the Central Portion of the Study Area



Site Locations in the Southern Portion of the Study Area

RIVER VIEW



SOUNDRING DATA

NAME OF SECTION RIVER VIEW

DATE OF SOUNDING NOVEMBER 8, 1984

WATER SURFACE ELEVATION in feet = 97.6

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| E | 0.0 | 102.6 |
| 2 | 37.0 | 97.6 |
| 3 | 45.0 | 96.1 |
| 4 | 55.0 | 95.3 |
| 5 | 65.0 | 94.3 |
| 6 | 78.0 | 92.3 |
| 7 | 110.0 | 92.3 |
| 8 | 205.0 | 92.3 |
| 9 | 248.0 | 90.6 |
| 10 | 338.0 | 78.1 |
| 11 | 368.0 | 77.6 |
| 12 | 424.0 | 79.3 |
| 13 | 517.0 | 85.0 |
| 14 | 540.0 | 82.6 |
| 15 | 577.0 | 66.2 |
| 16 | 620.0 | 64.8 |
| 17 | 693.0 | 64.6 |
| 18 | 705.0 | 65.8 |
| 19 | 801.0 | 65.4 |
| 20 | 1049.0 | 64.6 |
| 21 | 1081.0 | 63.0 |
| 22 | 1106.0 | 65.6 |
| 23 | 1132.0 | 66.0 |
| 24 | 1142.0 | 64.2 |
| 25 | 1191.0 | 66.6 |
| 26 | 1211.0 | 77.6 |
| 27 | 1225.0 | 79.1 |
| 28 | 1322.0 | 85.1 |
| 29 | 1333.0 | 90.6 |
| 30 | 1357.0 | 91.6 |
| 31 | 1378.0 | 89.9 |
| 32 | 1391.0 | 91.1 |
| 33 | 1412.0 | 91.6 |
| 34 | 1425.0 | 91.3 |
| 35 | 1436.0 | 91.0 |
| 36 | 1488.0 | 92.6 |
| 37 | 1528.0 | 92.6 |
| 38 | 1558.0 | 91.8 |
| 39 | 1570.0 | 91.7 |
| 40 | 1577.0 | 92.9 |

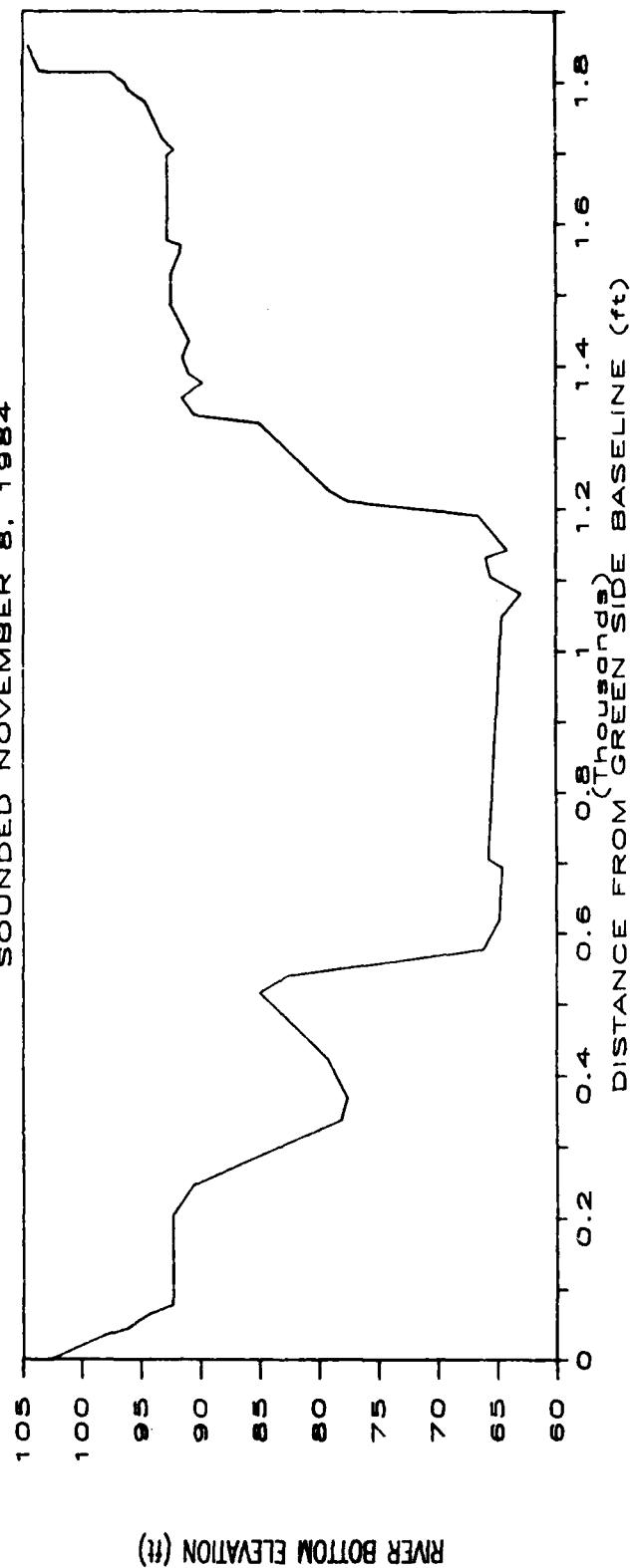
XX
SOUNDING DATA (continued)

NAME OF SECTION RIVER VIEW
XX

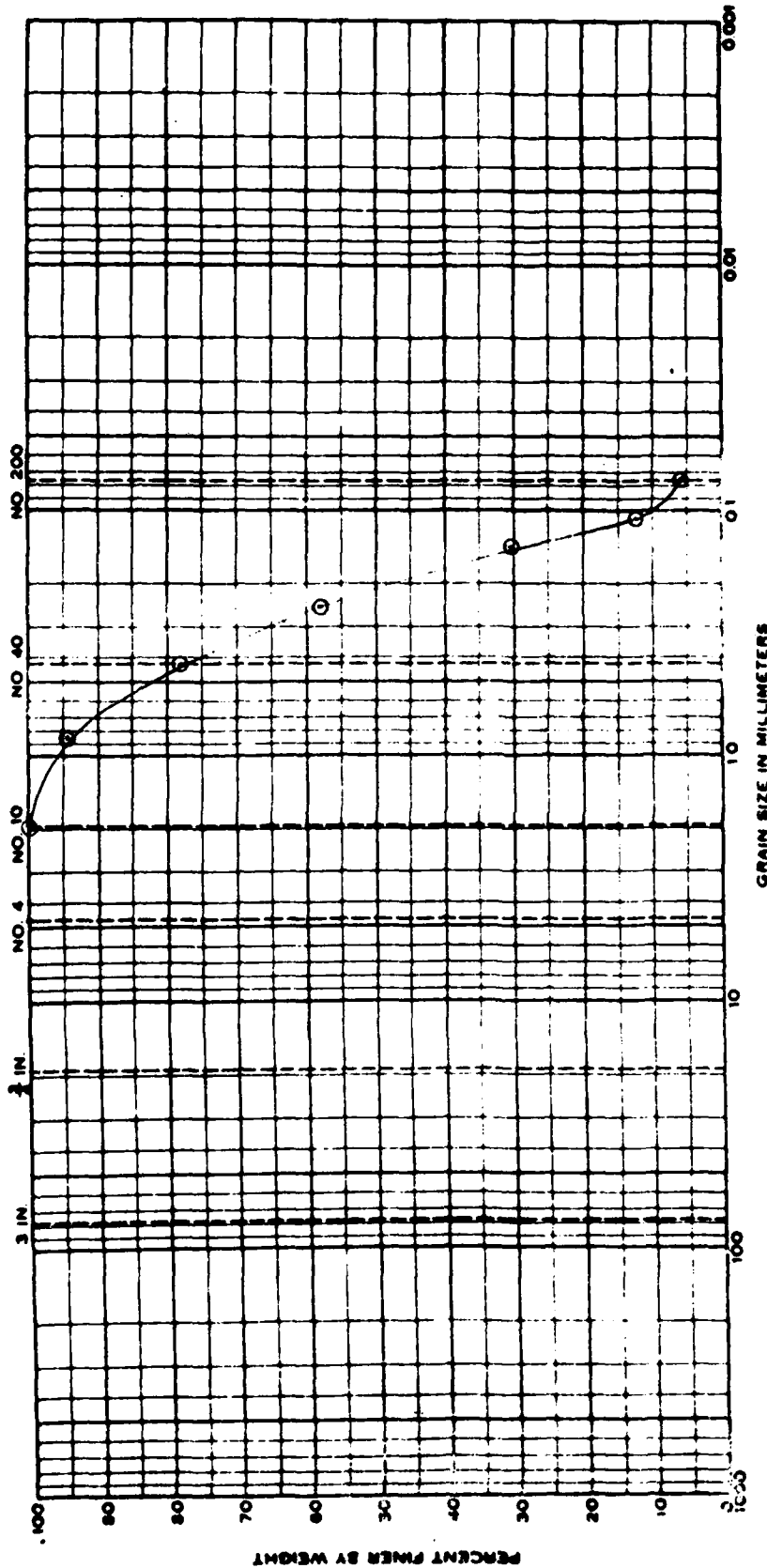
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 41 | 1606.0 | 92.9 |
| 42 | 1697.0 | 92.9 |
| 43 | 1704.0 | 92.3 |
| 44 | 1721.0 | 93.3 |
| 45 | 1772.0 | 94.7 |
| 46 | 1790.0 | 96.1 |
| 47 | 1800.0 | 96.4 |
| 48 | 1813.5 | 97.6 |
| 49 | 1813.6 | 102.6 |
| 50 | 1816.0 | 103.6 |
| B | 1850.0 | 104.6 |

RIVER VIEW CROSS-SECTION

SOUNDED NOVEMBER 8, 1984



U S STANDARD SIEVE SIZE

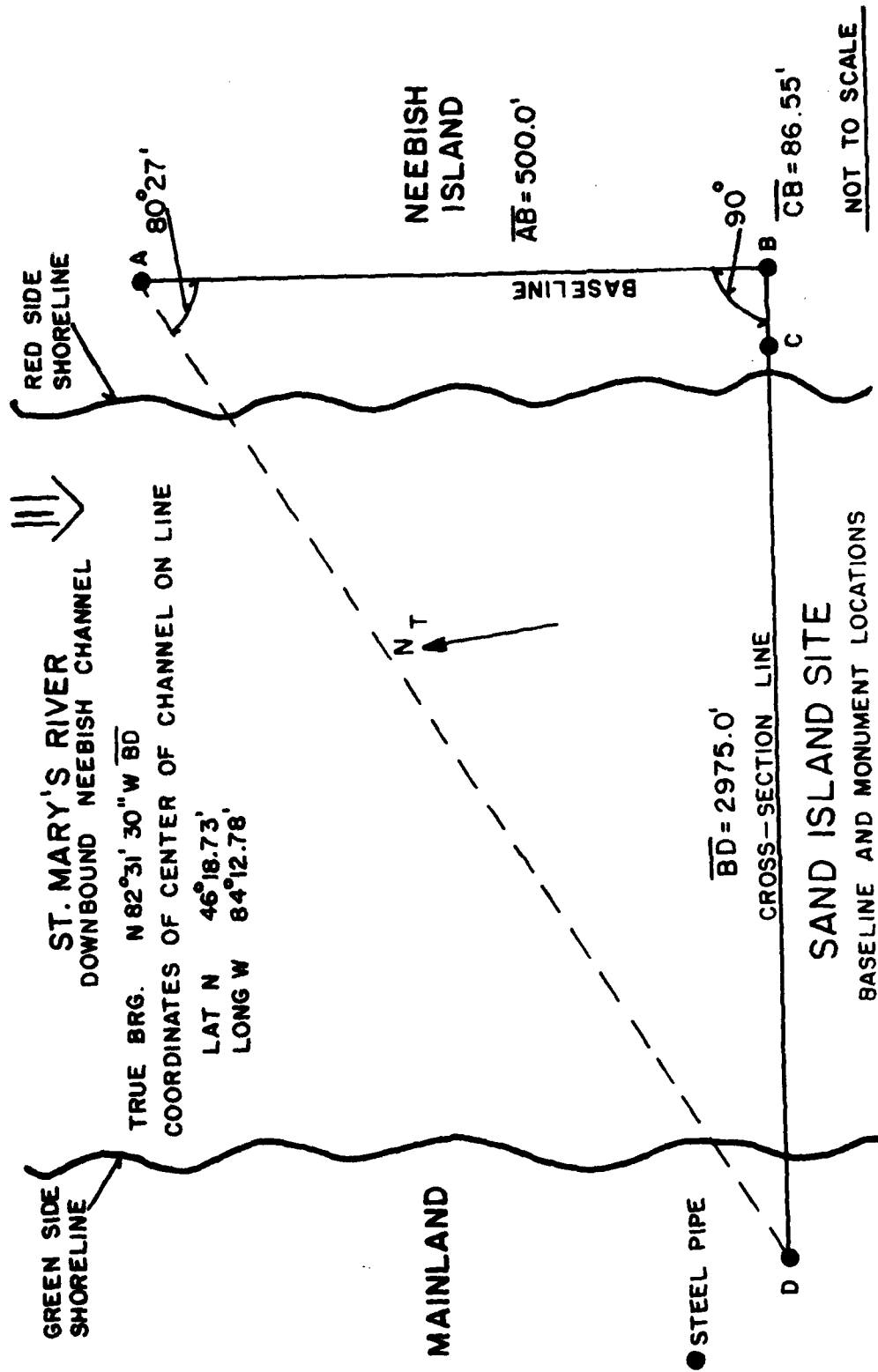


| | | | | | | | |
|---------|------|--------|------|--------|------|--------------|--|
| COBBLES | | GRAVEL | | SAND | | SILT OR CLAY | |
| Coarse | Fine | Coarse | Fine | Medium | Fine | | |

| | | | | | | | |
|------------|---------------|----------------|-------|----|----|----|----------------------------|
| Sample No. | Elev or Depth | Classification | NatWC | LL | PL | PI | Project |
| | | SP-SM | | | | | DACA89-85-K-0001 |
| | | | | | | | Area River View Green Side |
| | | | | | | | Boring No. Trap Sample |
| | | | | | | | Date Sampled 6/16/85 |

GRADATION CURVES

SAND ISLAND



XX
SOUNDING DATA

NAME OF SECTION SAND ISLAND
XX

DATE OF SOUNDING JULY 26, 1985

WATER SURFACE ELEVATION in feet = 100

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| D | 0.0 | 102.0 |
| 2 | 11.0 | 99.5 |
| 3 | 16.0 | 99.0 |
| 4 | 19.0 | 98.9 |
| 5 | 20.0 | 98.6 |
| 6 | 30.0 | 98.3 |
| 7 | 40.0 | 98.0 |
| 8 | 50.0 | 97.5 |
| 9 | 60.0 | 97.0 |
| 10 | 80.0 | 96.5 |
| 11 | 90.0 | 93.5 |
| 12 | 136.4 | 96.6 |
| 13 | 187.9 | 95.0 |
| 14 | 333.1 | 93.6 |
| 15 | 500.7 | 93.1 |
| 16 | 535.5 | 93.6 |
| 17 | 542.1 | 93.3 |
| 18 | 597.2 | 93.0 |
| 19 | 650.1 | 92.5 |
| 20 | 668.8 | 93.3 |
| 21 | 685.0 | 93.4 |
| 22 | 706.0 | 92.8 |
| 23 | 719.0 | 92.6 |
| 24 | 746.0 | 93.5 |
| 25 | 784.0 | 93.4 |
| 26 | 818.0 | 93.9 |
| 27 | 835.0 | 93.5 |
| 28 | 898.0 | 94.0 |
| 29 | 939.0 | 92.4 |
| 30 | 994.0 | 93.3 |
| 31 | 1016.0 | 93.0 |
| 32 | 1063.0 | 93.4 |
| 33 | 1198.0 | 91.8 |
| 34 | 1226.0 | 91.9 |
| 35 | 1264.0 | 92.8 |
| 36 | 1294.0 | 92.3 |
| 37 | 1343.0 | 92.2 |
| 38 | 1366.0 | 90.6 |
| 39 | 1406.0 | 90.5 |
| 40 | 1432.0 | 89.9 |

SOUNDRNG DATA (continued)

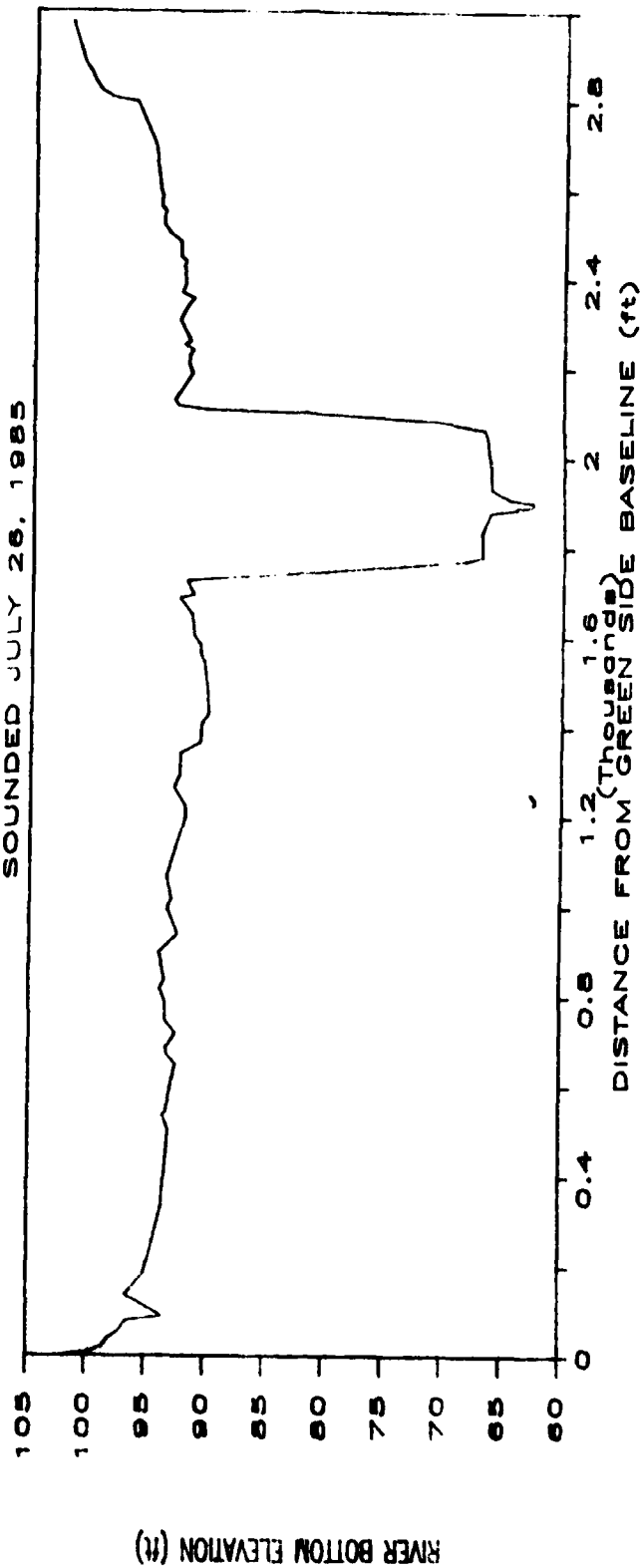
NAME OF SECTION SAND ISLAND

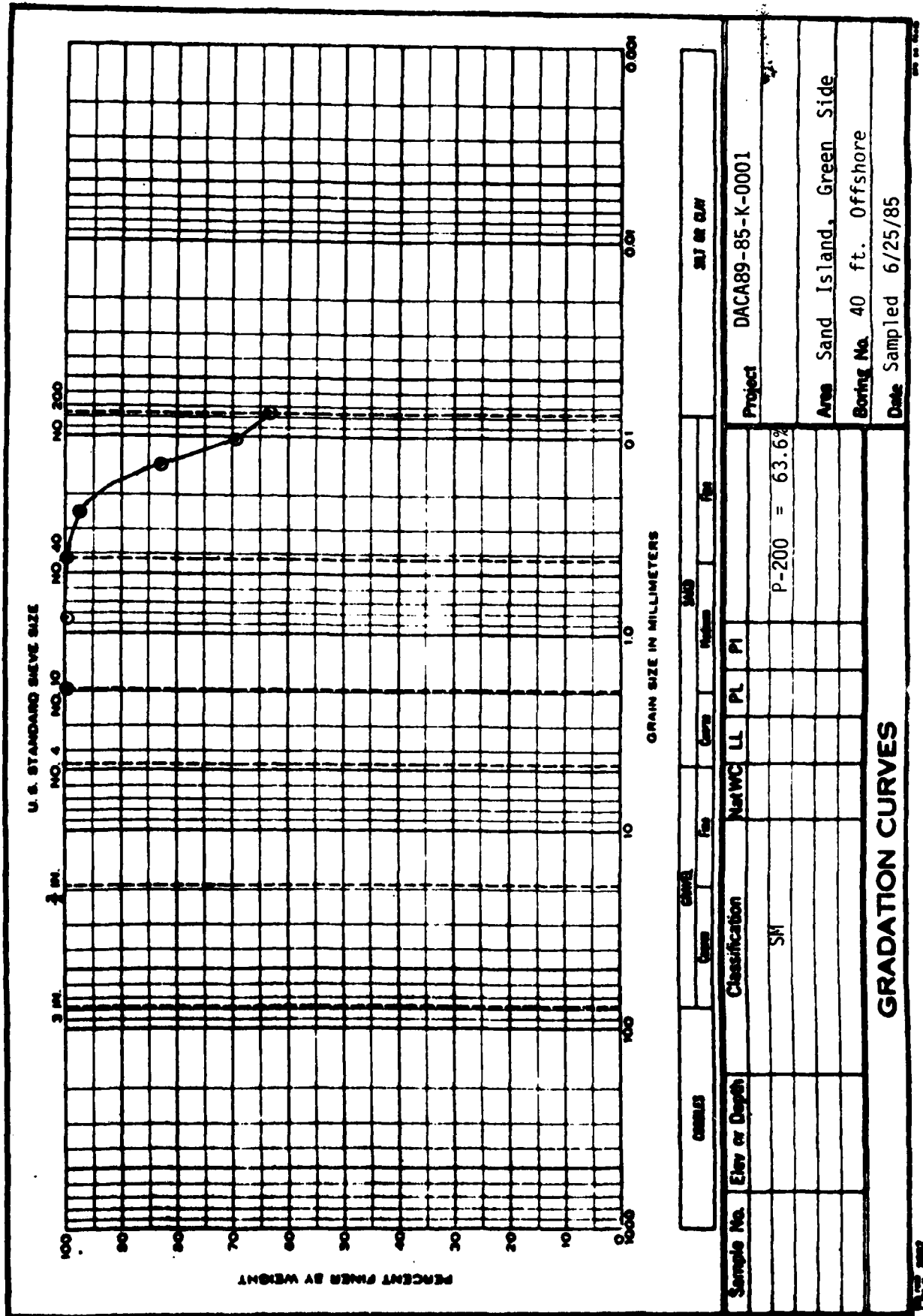
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 41 | 1546.0 | 90.4 |
| 42 | 1561.0 | 90.7 |
| 43 | 1583.0 | 90.7 |
| 44 | 1606.0 | 91.3 |
| 45 | 1651.0 | 91.5 |
| 46 | 1686.0 | 92.5 |
| 47 | 1694.0 | 91.3 |
| 48 | 1725.0 | 91.9 |
| 49 | 1747.0 | 80.0 |
| 50 | 1771.0 | 68.3 |
| 51 | 1782.0 | 66.9 |
| 52 | 1832.0 | 67.0 |
| 53 | 1878.0 | 66.2 |
| 54 | 1885.0 | 64.0 |
| 55 | 1889.0 | 64.0 |
| 56 | 1893.0 | 62.6 |
| 57 | 1903.0 | 62.7 |
| 58 | 1907.0 | 64.6 |
| 59 | 1930.0 | 66.2 |
| 60 | 1982.0 | 66.3 |
| 61 | 2015.0 | 66.5 |
| 62 | 2045.0 | 66.5 |
| 63 | 2063.0 | 66.8 |
| 64 | 2080.0 | 70.5 |
| 65 | 2098.0 | 81.0 |
| 66 | 2105.0 | 90.2 |
| 67 | 2115.0 | 92.9 |
| 68 | 2127.0 | 93.1 |
| 69 | 2185.0 | 91.6 |
| 70 | 2209.0 | 91.9 |
| 71 | 2226.0 | 91.9 |
| 72 | 2240.0 | 91.6 |
| 73 | 2251.0 | 92.3 |
| 74 | 2259.0 | 91.8 |
| 75 | 2306.0 | 92.7 |
| 76 | 2340.0 | 92.0 |
| 77 | 2355.0 | 91.5 |
| 78 | 2369.0 | 92.5 |
| 79 | 2388.0 | 92.2 |
| 80 | 2410.0 | 92.3 |
| 81 | 2427.0 | 92.4 |
| 82 | 2439.0 | 92.2 |
| 83 | 2450.0 | 92.7 |
| 84 | 2484.0 | 92.7 |

NAME OF SECTION SAND ISLAND
 CC

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 85 | 2501.0 | 93.6 |
| 86 | 2522.0 | 94.1 |
| 87 | 2550.0 | 94.0 |
| 88 | 2564.0 | 94.4 |
| 89 | 2585.0 | 94.3 |
| 90 | 2601.0 | 94.5 |
| 91 | 2706.0 | 95.0 |
| 92 | 2798.0 | 96.5 |
| 93 | 2804.0 | 98.0 |
| 94 | 2808.0 | 98.6 |
| 95 | 2821.0 | 99.5 |
| 96 | 2888.0 | 101.0 |
| B | 2975.0 | 102.0 |

SAND ISLAND CROSS-SECTION SOUNDED JULY 26, 1985

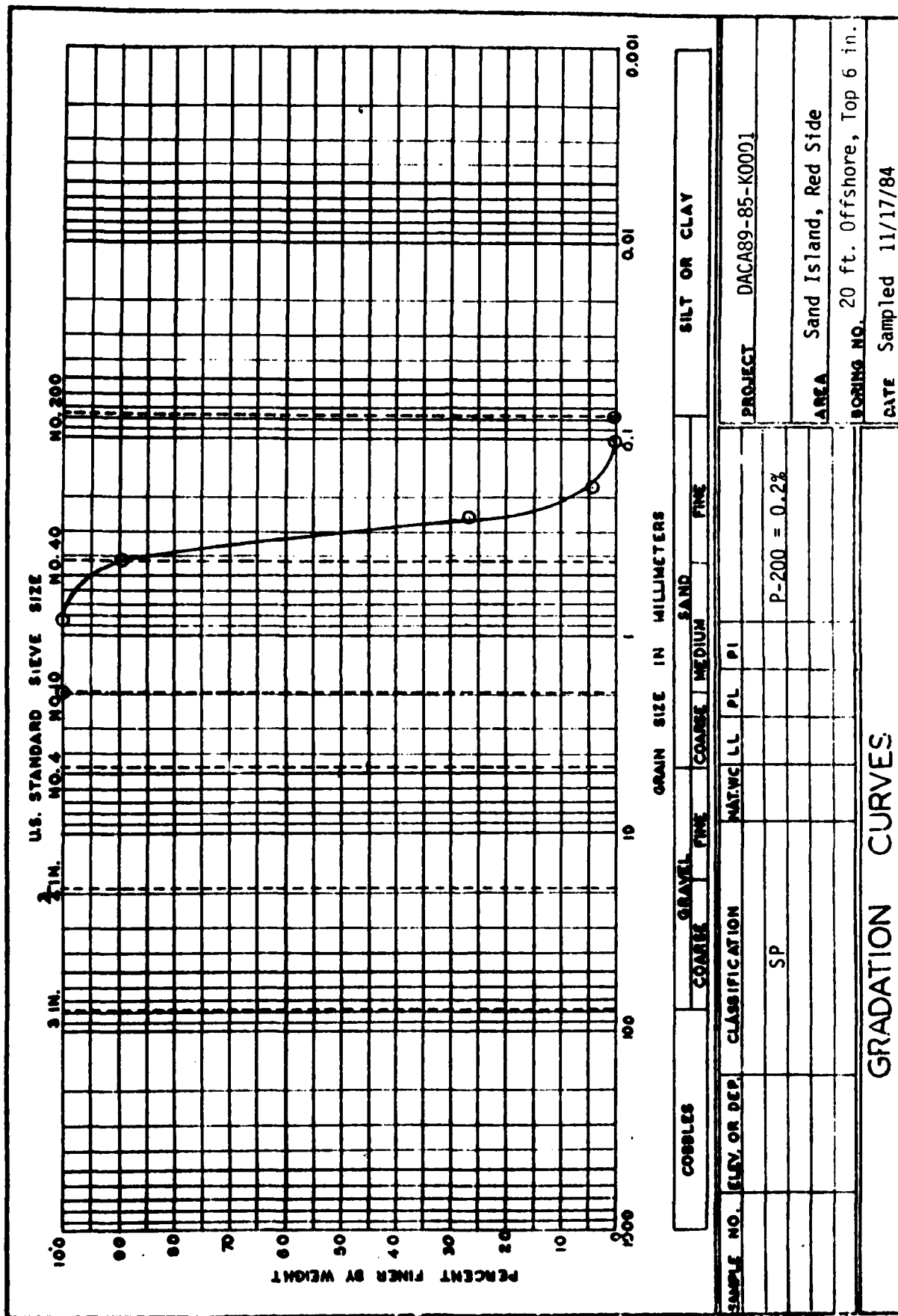


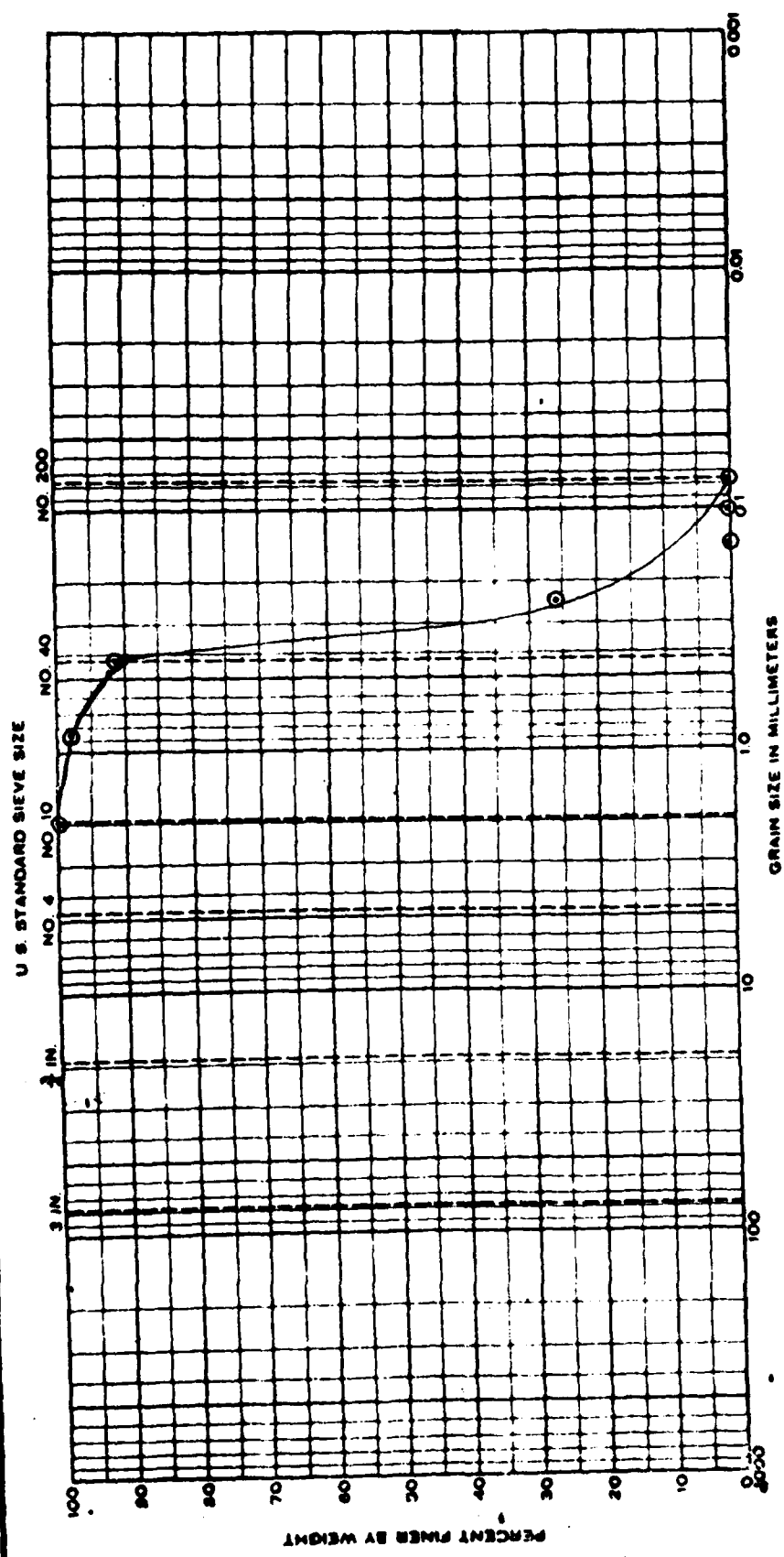


| | | | | | | | |
|--------|--------|------|------|------|------|--------------|--|
| COARSE | | FINE | | SAND | | SILT OR CLAY | |
| Gravel | Coarse | Fine | Sand | Silt | Clay | | |

| | | | | | | | |
|------------|---------------|----------------|-------|----|----|----|------------------------------|
| Sample No. | Elev or Depth | Classification | NatWC | LL | PL | PI | Project |
| | | SM | | | | | DACA89-85-K-0001 |
| | | | | | | | |
| | | | | | | | Area Sand Island, Green Side |
| | | | | | | | Boring No. 40 ft. Offshore |
| | | | | | | | Date Sampled 6/25/85 |

GRADATION CURVES





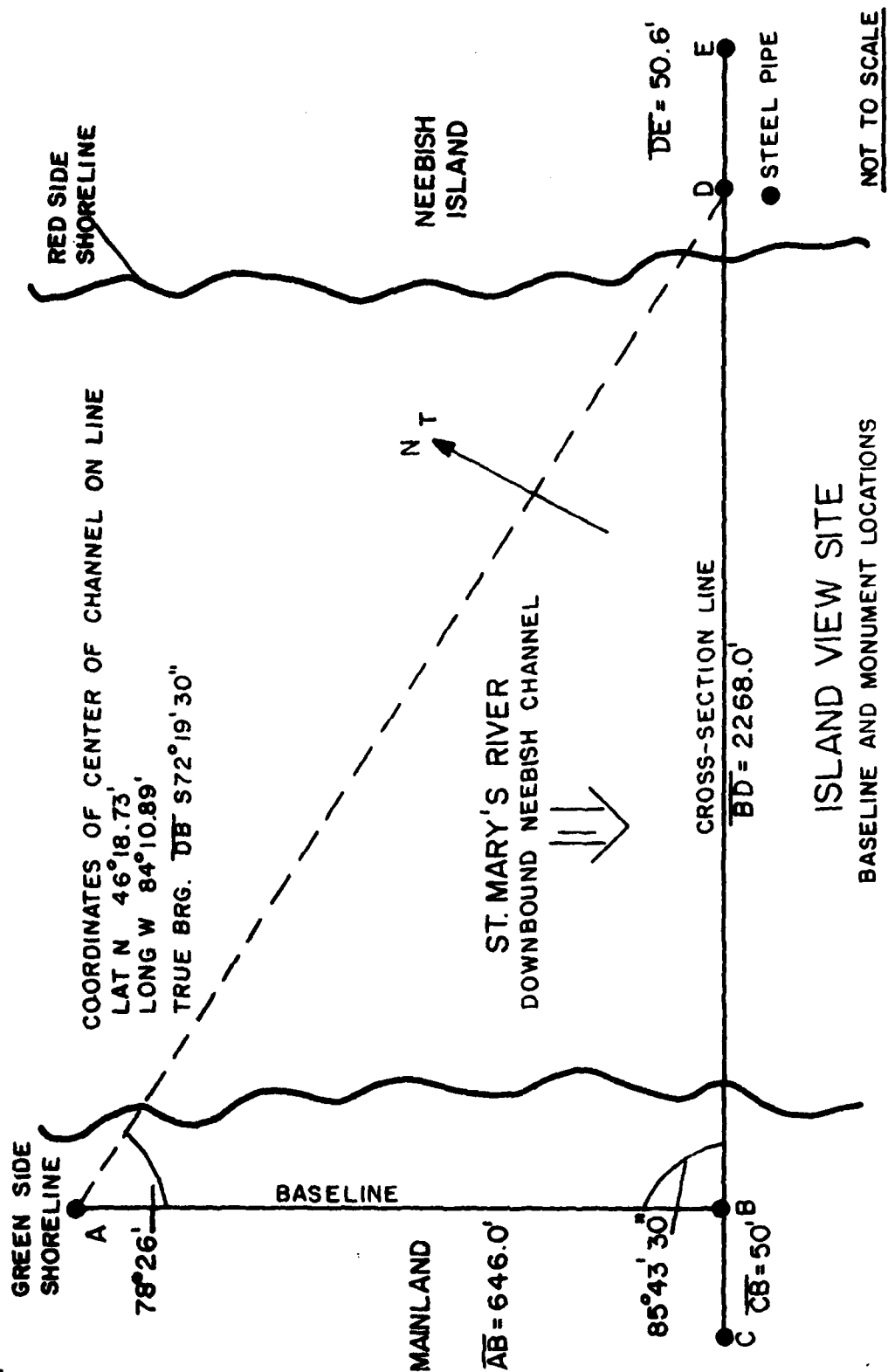
| | | | |
|----------------|--|-----------------------|--|
| SUBJECT OR QTY | | NO. OF TESTS | |
| Project | | DACA89-85-K-0001 | |
| Area | | Sand Island, Red Side | |
| Boring No. | | Trap Facing Shore | |
| Date | | C.M. Beeghly 6/25/85 | |

| Sample No. | Elev or Depth | Classification | NatWC | LL | PL | PI |
|------------|---------------|----------------|-------|----|----|----|
| | | SP | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

P-200 = 0.25

GRADATION CURVES

ISLAND VIEW



SOUNDRING DATA

NAME OF SECTION ISLAND VIEW

DATE OF SOUNDING NOVEMBER 2, 1984

WATER SURFACE ELEVATION in feet = 96.31

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| B | 0.0 | 99.3 |
| 2 | 12.0 | 98.3 |
| 3 | 14.0 | 97.3 |
| 4 | 15.2 | 96.3 |
| 5 | 25.0 | 95.1 |
| 6 | 35.0 | 94.9 |
| 7 | 45.0 | 94.6 |
| 8 | 55.0 | 94.1 |
| 9 | 65.0 | 93.6 |
| 10 | 75.0 | 93.4 |
| 11 | 85.0 | 93.1 |
| 12 | 95.0 | 93.0 |
| 13 | 236.0 | 91.7 |
| 14 | 254.0 | 82.7 |
| 15 | 270.0 | 80.7 |
| 16 | 305.0 | 79.5 |
| 17 | 418.0 | 74.7 |
| 18 | 478.0 | 73.3 |
| 19 | 599.0 | 73.2 |
| 20 | 622.0 | 72.3 |
| 21 | 668.0 | 72.4 |
| 22 | 712.0 | 71.6 |
| 23 | 733.0 | 61.6 |
| 24 | 891.0 | 61.3 |
| 25 | 944.0 | 62.7 |
| 26 | 959.0 | 62.3 |
| 27 | 983.0 | 63.3 |
| 28 | 1063.0 | 62.3 |
| 29 | 1083.0 | 61.0 |
| 30 | 1235.0 | 63.7 |
| 31 | 1250.0 | 64.5 |
| 32 | 1267.0 | 73.6 |
| 33 | 1285.0 | 75.7 |
| 34 | 1306.0 | 76.3 |
| 35 | 1320.0 | 81.2 |
| 36 | 1413.0 | 81.5 |
| 37 | 1607.0 | 85.3 |
| 38 | 1703.0 | 85.3 |
| 39 | 1999.0 | 88.0 |
| 40 | 2074.0 | 90.9 |

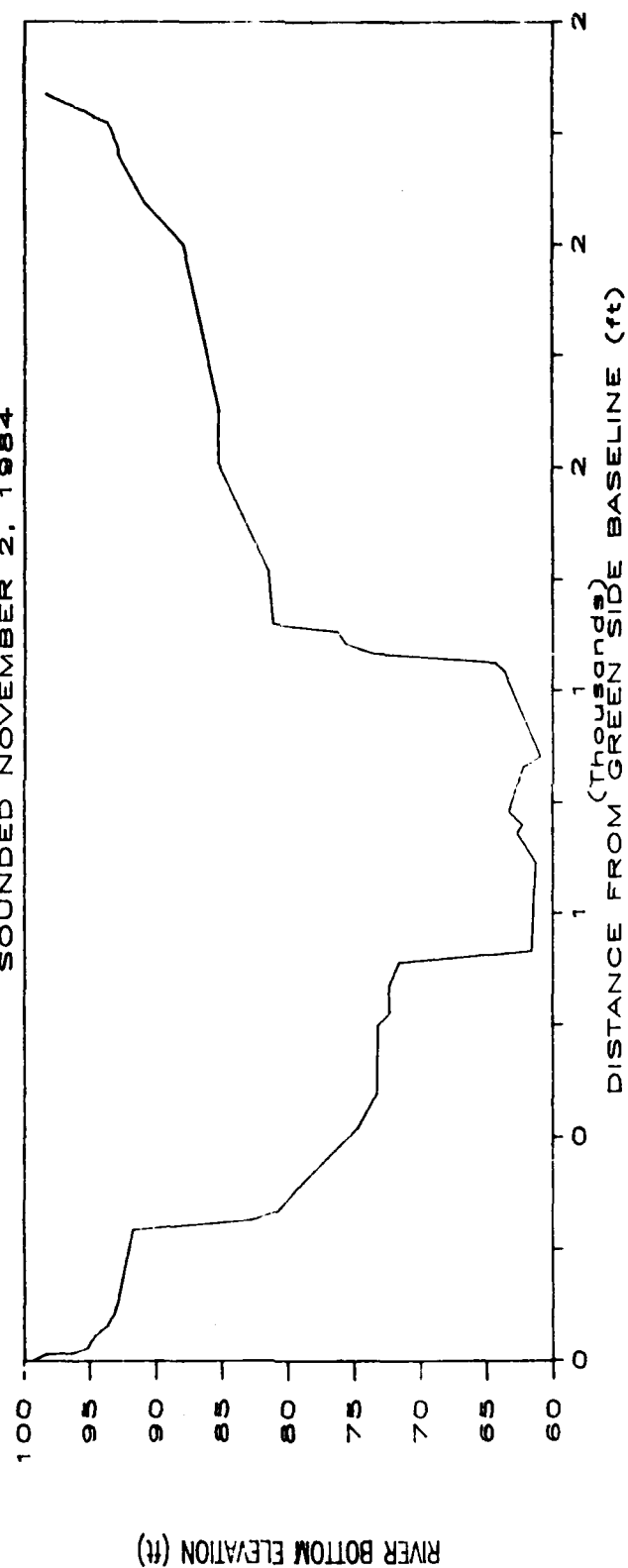
A
 SOUNDRING DATA (continued)

NAME OF SECTION ISLAND VIEW
 SOUNDRING DATA (continued)

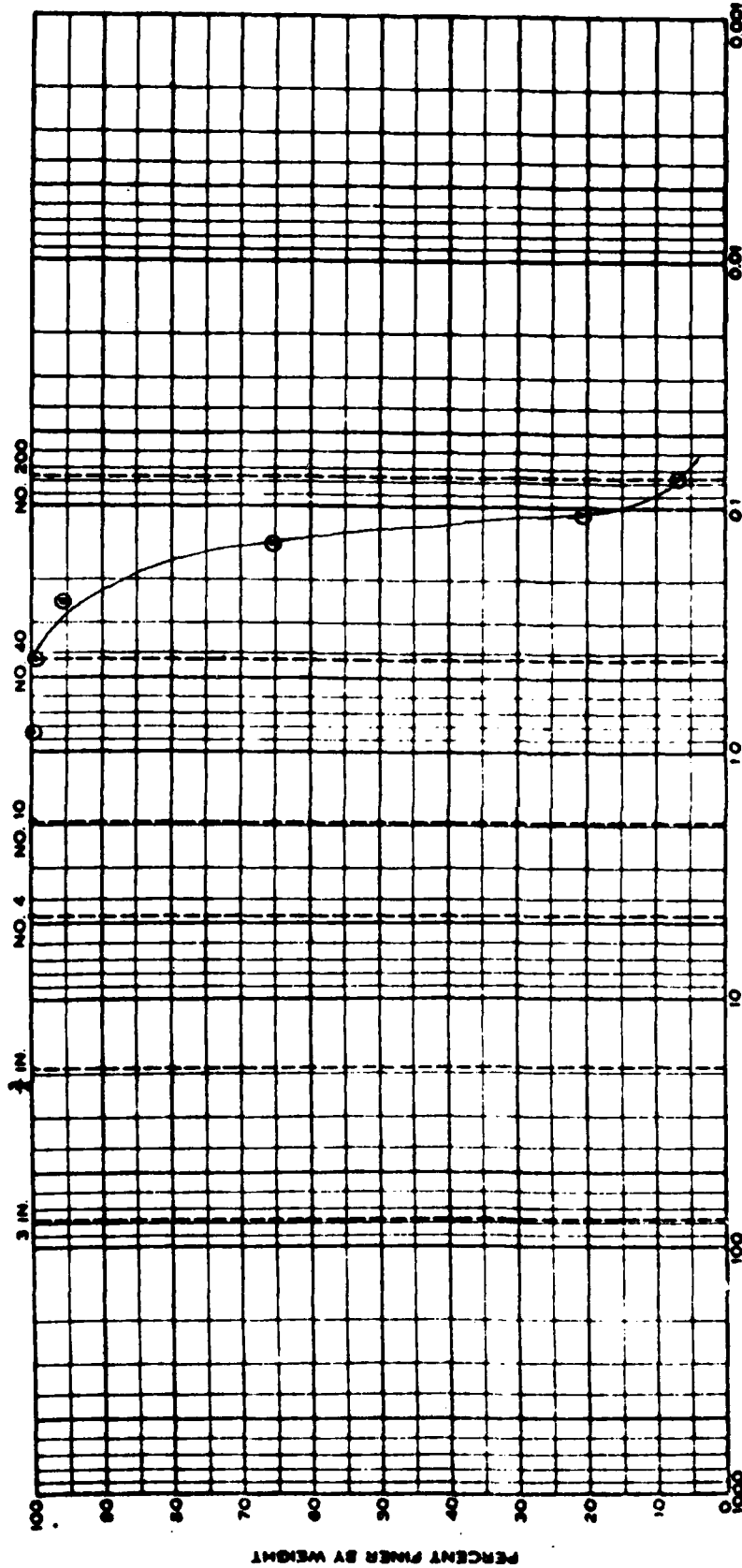
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 41 | 2148.0 | 92.6 |
| 42 | 2158.0 | 92.8 |
| 43 | 2168.0 | 92.9 |
| 44 | 2178.0 | 93.0 |
| 45 | 2188.0 | 93.2 |
| 46 | 2198.0 | 93.3 |
| 47 | 2208.0 | 93.5 |
| 48 | 2218.0 | 93.7 |
| 49 | 2228.0 | 94.7 |
| 50 | 2238.0 | 95.4 |
| 51 | 2247.0 | 96.3 |
| D | 2268.0 | 98.3 |

ISLAND VIEW CROSS-SECTION

SOUNDED NOVEMBER 2, 1984



U. S. STANDARD SIEVE SIZE



GRAIN SIZE IN MILLIMETERS

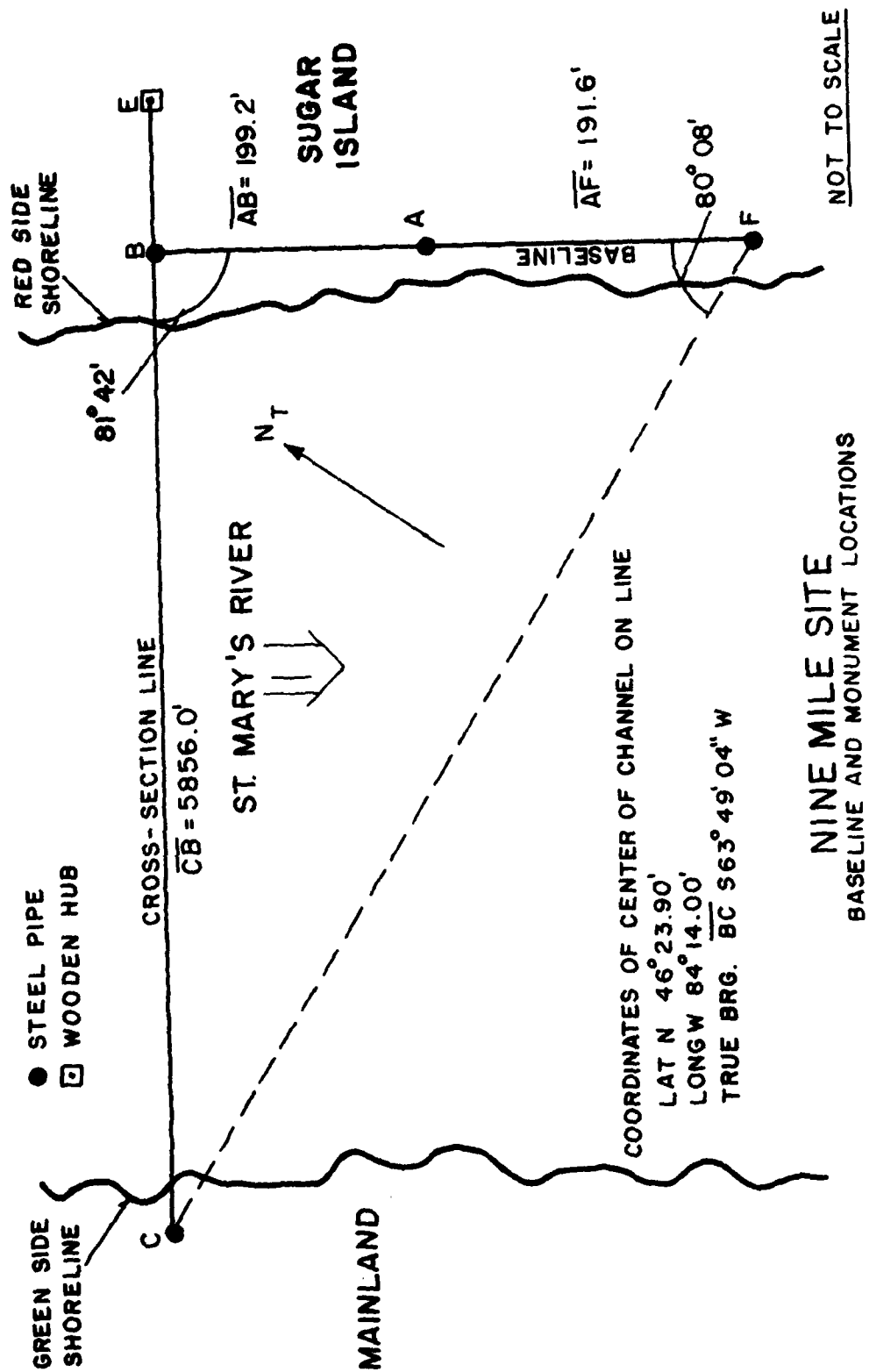
| | | | | | | | |
|--------|--------|--------|--------|------|------|--------------|--------------|
| COARSE | | MEDIUM | | FINE | | SILT OR CLAY | |
| Coarse | Coarse | Medium | Medium | Fine | Fine | Silt or Clay | Silt or Clay |

| | | | | | | | |
|------------|---------------|----------------|-------|----|----|----|------------------------------|
| Sample No. | Elev or Depth | Classification | NatWC | LL | PL | PI | Project |
| | | SP | | | | | DACA89-85-K-0001 |
| | | | | | | | Area Island View, Green Side |
| | | | | | | | Boring No. 30 ft. Offshore |
| | | | | | | | Date Sampled 6/25/85 |

GRADATION CURVES

PL 2 8887

NINE MILE



XX
SOUNDING DATA

NAME OF SECTION NINE MILE
XX

DATE OF SOUNDING NOVEMBER 6, 1984

WATER SURFACE ELEVATION in feet = 94.1

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| C | 0.0 | 95.1 |
| 2 | 100.0 | 94.1 |
| 3 | 200.0 | 93.6 |
| 4 | 314.0 | 89.7 |
| 5 | 816.0 | 85.4 |
| 6 | 1054.0 | 85.4 |
| 7 | 1059.0 | 84.8 |
| 8 | 1108.0 | 85.3 |
| 9 | 1306.0 | 85.1 |
| 10 | 1371.0 | 86.5 |
| 11 | 1475.0 | 88.0 |
| 12 | 1547.0 | 86.5 |
| 13 | 1625.0 | 84.7 |
| 14 | 1673.0 | 85.2 |
| 15 | 1785.0 | 81.8 |
| 16 | 1939.0 | 80.8 |
| 17 | 2067.0 | 78.0 |
| 18 | 2092.0 | 79.6 |
| 19 | 2185.0 | 75.4 |
| 20 | 2384.0 | 73.4 |
| 21 | 2428.0 | 71.5 |
| 22 | 2473.0 | 72.6 |
| 23 | 2519.0 | 71.2 |
| 24 | 2547.0 | 64.1 |
| 25 | 2570.0 | 61.8 |
| 26 | 2701.0 | 62.1 |
| 27 | 2714.0 | 50.2 |
| 28 | 2798.0 | 60.5 |
| 29 | 3174.0 | 60.9 |
| 30 | 3644.0 | 60.3 |
| 31 | 3993.0 | 58.7 |
| 32 | 4008.0 | 55.1 |
| 33 | 4236.0 | 60.9 |
| 34 | 4287.0 | 61.1 |
| 35 | 4363.0 | 58.6 |
| 36 | 4562.0 | 59.1 |
| 37 | 4604.0 | 58.1 |
| 38 | 4676.0 | 59.8 |
| 39 | 4807.0 | 60.9 |
| 40 | 4878.0 | 61.1 |

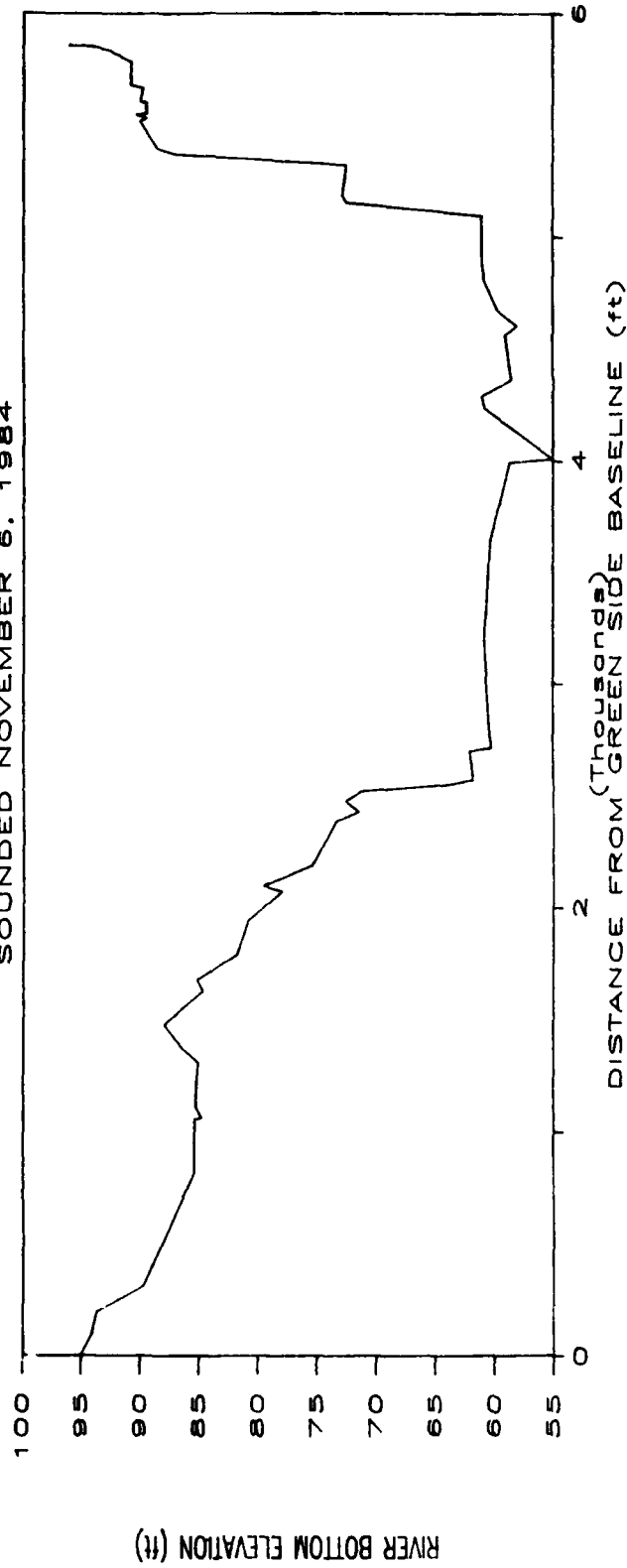
XX
SOUNDING DATA (continued)

NAME OF SECTION NINE MILE
XX

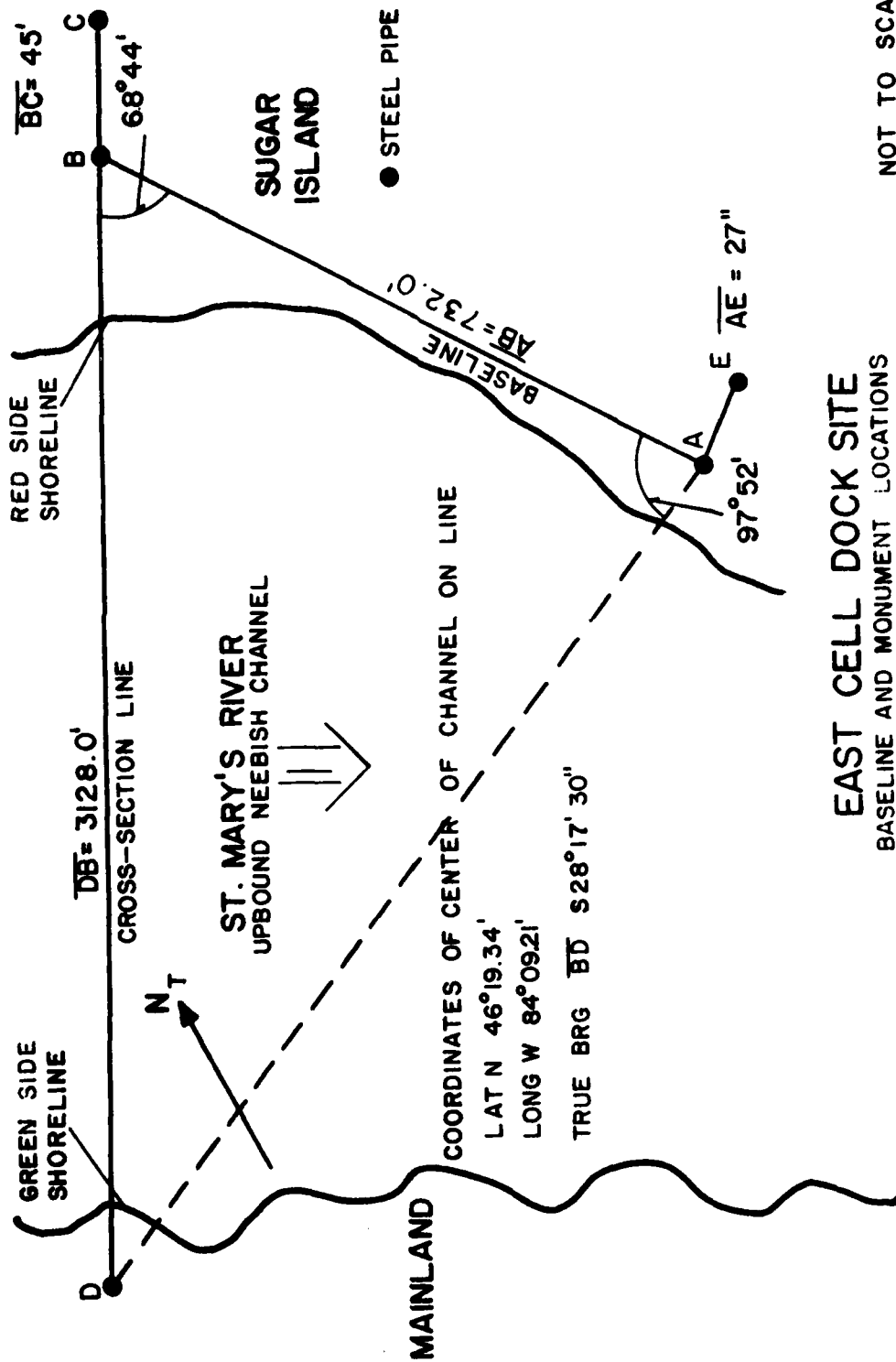
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 41 | 5094.0 | 61.1 |
| 42 | 5153.0 | 72.6 |
| 43 | 5184.0 | 72.9 |
| 44 | 5319.0 | 72.5 |
| 45 | 5369.0 | 87.1 |
| 46 | 5396.0 | 88.7 |
| 47 | 5517.0 | 90.1 |
| 48 | 5532.0 | 89.5 |
| 49 | 5548.0 | 90.4 |
| 50 | 5549.0 | 89.5 |
| 51 | 5598.0 | 89.5 |
| 52 | 5607.0 | 90.1 |
| 53 | 5666.0 | 89.8 |
| 54 | 5680.0 | 90.9 |
| 55 | 5781.0 | 90.8 |
| 56 | 5791.0 | 91.2 |
| 57 | 5801.0 | 91.6 |
| 58 | 5811.0 | 91.8 |
| 59 | 5821.0 | 92.3 |
| 60 | 5831.0 | 92.6 |
| 61 | 5841.0 | 93.3 |
| 62 | 5849.0 | 94.1 |
| 63 | 5852.0 | 94.6 |
| 64 | 5852.5 | 96.1 |
| B | 5856.0 | 96.1 |

NINE MILE CROSS-SECTION

SOUNDED NOVEMBER 6, 1984



EAST CELL DOCK



EAST CELL DOCK SITE BASELINE AND MONUMENT LOCATIONS

NOT TO SCALE

@@
 SOUNDING DATA

NAME OF SECTION EAST CELL DOCK
 @@

DATE OF SOUNDING NOVEMBER 7, 1984

WATER SURFACE ELEVATION in feet = 100.0

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| D | 0.0 | 102.0 |
| 2 | 14.0 | 100.0 |
| 3 | 20.0 | 98.9 |
| 4 | 28.0 | 98.4 |
| 5 | 32.0 | 97.4 |
| 6 | 35.0 | 96.4 |
| 7 | 40.0 | 96.3 |
| 8 | 50.0 | 96.0 |
| 9 | 65.0 | 95.4 |
| 10 | 76.0 | 94.7 |
| 11 | 91.0 | 94.8 |
| 12 | 97.0 | 94.3 |
| 13 | 135.0 | 94.3 |
| 14 | 147.0 | 94.9 |
| 15 | 165.0 | 94.7 |
| 16 | 183.0 | 93.4 |
| 17 | 203.0 | 92.1 |
| 18 | 257.0 | 86.0 |
| 19 | 307.0 | 82.7 |
| 20 | 375.0 | 79.0 |
| 21 | 381.0 | 76.4 |
| 22 | 384.0 | 77.0 |
| 23 | 387.0 | 76.0 |
| 24 | 394.0 | 72.5 |
| 25 | 410.0 | 64.5 |
| 26 | 422.0 | 64.9 |
| 27 | 429.0 | 63.6 |
| 28 | 437.0 | 63.0 |
| 29 | 463.0 | 63.4 |
| 30 | 469.0 | 62.3 |
| 31 | 475.0 | 62.3 |
| 32 | 484.0 | 63.6 |
| 33 | 486.0 | 62.0 |
| 34 | 511.0 | 64.0 |
| 35 | 514.0 | 63.5 |
| 36 | 525.0 | 64.6 |
| 37 | 528.0 | 63.6 |
| 38 | 543.0 | 63.6 |
| 39 | 558.0 | 66.0 |
| 40 | 573.0 | 66.5 |

SOUNDRNG DATA (continued)

NAME OF SECTION EAST CELL DOCK

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 41 | 583.0 | 67.5 |
| 42 | 605.0 | 64.4 |
| 43 | 618.0 | 64.0 |
| 44 | 639.0 | 64.2 |
| 45 | 649.0 | 70.0 |
| 46 | 656.0 | 72.0 |
| 47 | 662.0 | 71.1 |
| 48 | 672.0 | 72.9 |
| 49 | 695.0 | 71.8 |
| 50 | 744.0 | 72.2 |
| 51 | 762.0 | 73.2 |
| 52 | 824.0 | 72.5 |
| 53 | 830.0 | 72.9 |
| 54 | 961.0 | 72.7 |
| 55 | 1001.0 | 74.6 |
| 56 | 1012.0 | 74.4 |
| 57 | 1033.0 | 73.3 |
| 58 | 1048.0 | 74.3 |
| 59 | 1078.0 | 74.3 |
| 60 | 1174.0 | 77.7 |
| 61 | 1197.0 | 80.6 |
| 62 | 1229.0 | 81.5 |
| 63 | 1256.0 | 81.0 |
| 64 | 1297.0 | 82.1 |
| 65 | 1321.0 | 81.6 |
| 66 | 1347.0 | 82.8 |
| 67 | 1372.0 | 89.5 |
| 68 | 1383.0 | 91.0 |
| 69 | 1393.0 | 90.9 |
| 70 | 1400.0 | 90.5 |
| 71 | 1418.0 | 92.9 |
| 72 | 1440.0 | 90.6 |
| 73 | 1473.0 | 89.1 |
| 74 | 1474.0 | 89.9 |
| 75 | 1488.0 | 89.9 |
| 76 | 1501.0 | 89.2 |
| 77 | 1526.0 | 89.6 |
| 78 | 1583.0 | 87.8 |
| 79 | 1617.0 | 88.8 |
| 80 | 1630.0 | 88.0 |
| 81 | 1664.0 | 89.7 |
| 82 | 1690.0 | 89.4 |
| 83 | 1697.0 | 88.4 |
| 84 | 1708.0 | 88.2 |

SOUNDRING DATA (continued)

NAME OF SECTION EAST CELL DOCK

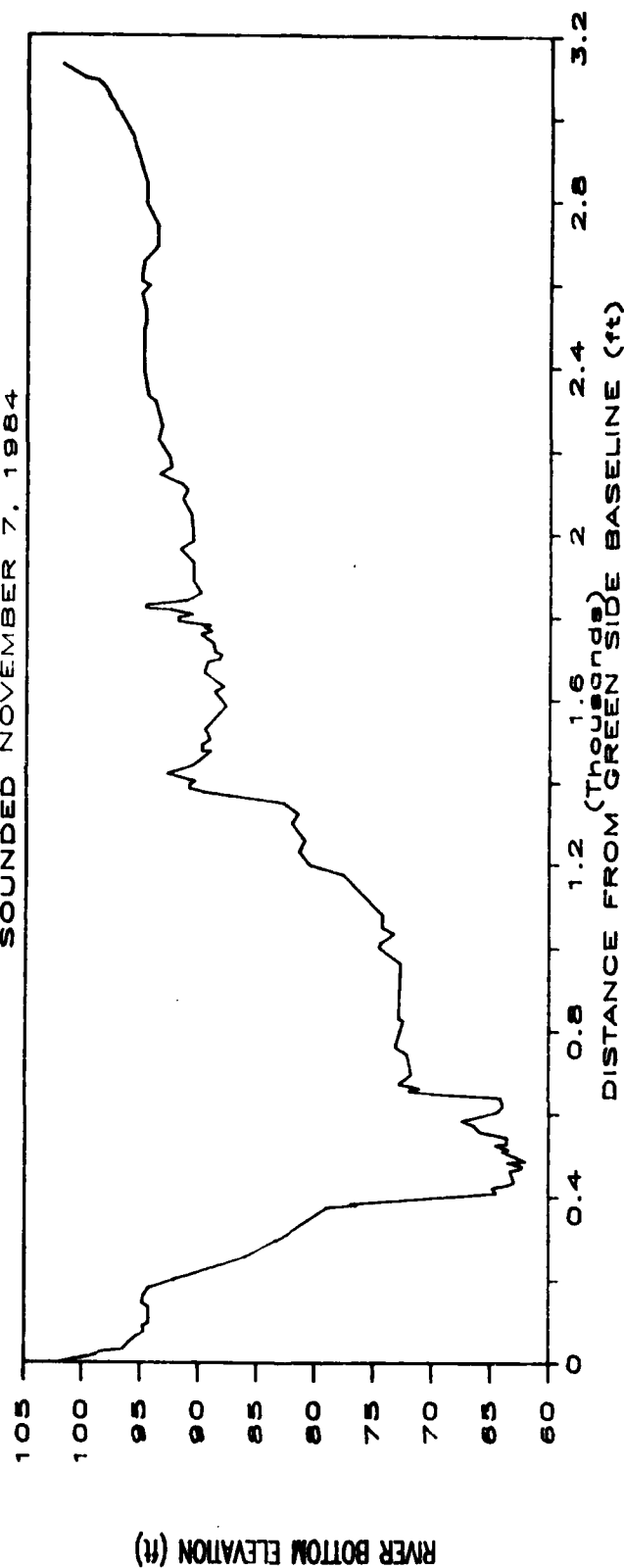
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 85 | 1714.0 | 88.8 |
| 86 | 1736.0 | 89.0 |
| 87 | 1757.0 | 90.0 |
| 88 | 1765.0 | 89.1 |
| 89 | 1774.0 | 89.7 |
| 90 | 1778.0 | 89.2 |
| 91 | 1781.0 | 89.8 |
| 92 | 1790.0 | 92.0 |
| 93 | 1798.0 | 92.0 |
| 94 | 1805.0 | 90.7 |
| 95 | 1816.0 | 92.6 |
| 96 | 1820.0 | 94.8 |
| 97 | 1828.0 | 94.7 |
| 98 | 1839.0 | 91.2 |
| 99 | 1857.0 | 90.0 |
| 100 | 1887.0 | 90.7 |
| 101 | 1930.0 | 90.7 |
| 102 | 1963.0 | 91.8 |
| 103 | 1981.0 | 90.7 |
| 104 | 2047.0 | 90.9 |
| 105 | 2080.0 | 91.6 |
| 106 | 2105.0 | 91.2 |
| 107 | 2118.0 | 91.7 |
| 108 | 2141.0 | 93.6 |
| 109 | 2157.0 | 92.6 |
| 110 | 2182.0 | 92.8 |
| 111 | 2222.0 | 93.7 |
| 112 | 2254.0 | 93.4 |
| 113 | 2316.0 | 94.0 |
| 114 | 2328.0 | 94.6 |
| 115 | 2388.0 | 95.0 |
| 116 | 2489.0 | 95.0 |
| 117 | 2503.0 | 94.8 |
| 118 | 2531.0 | 94.8 |
| 119 | 2575.0 | 95.2 |
| 120 | 2595.0 | 94.5 |
| 121 | 2605.0 | 95.2 |
| 122 | 2652.0 | 95.0 |
| 123 | 2689.0 | 93.8 |
| 124 | 2739.0 | 93.8 |
| 125 | 2791.0 | 94.8 |
| 126 | 2842.0 | 94.8 |
| 127 | 2959.0 | 96.1 |
| 128 | 2999.0 | 96.9 |

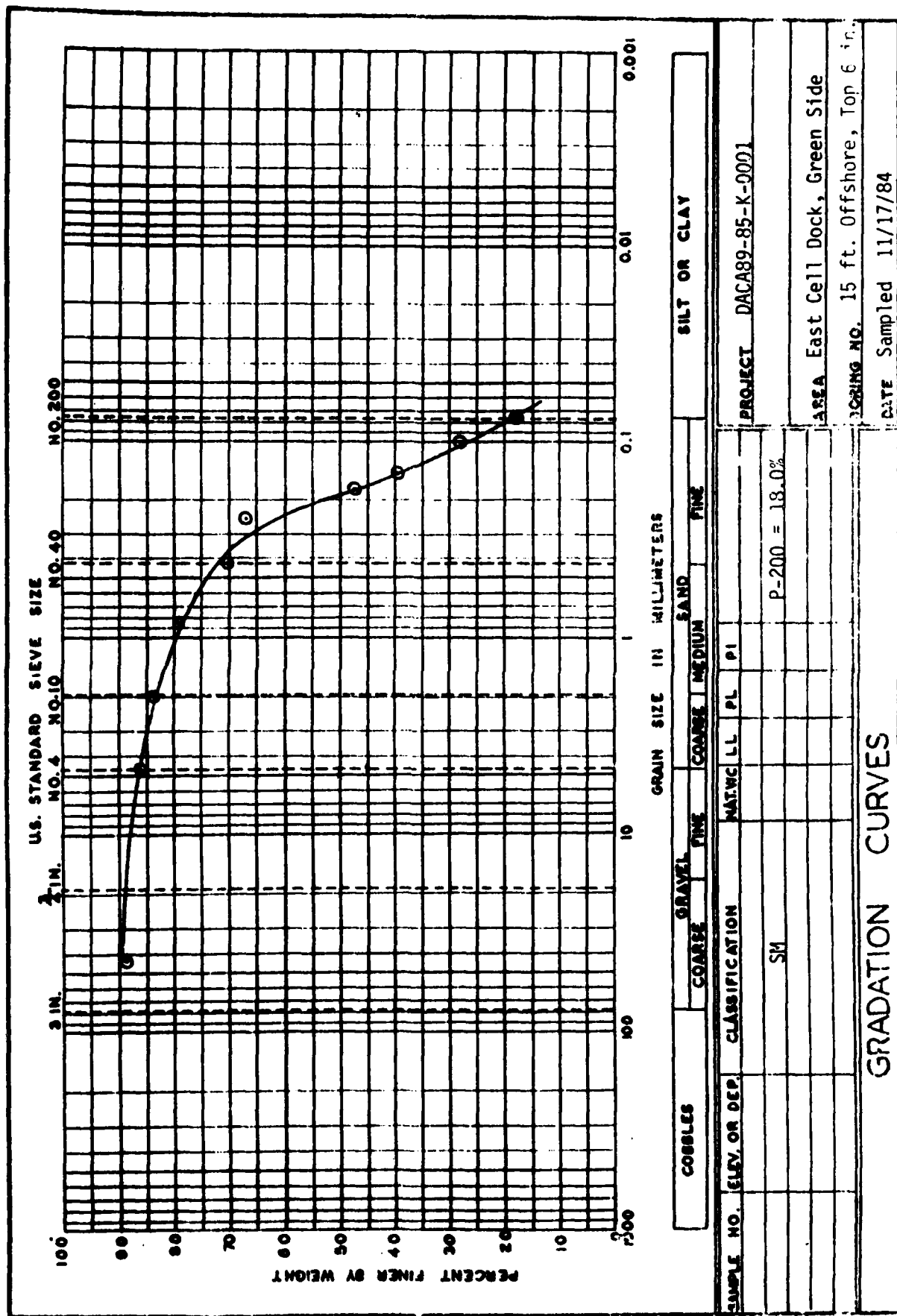
NAME OF SECTION EAST CELL DOCK
 CC

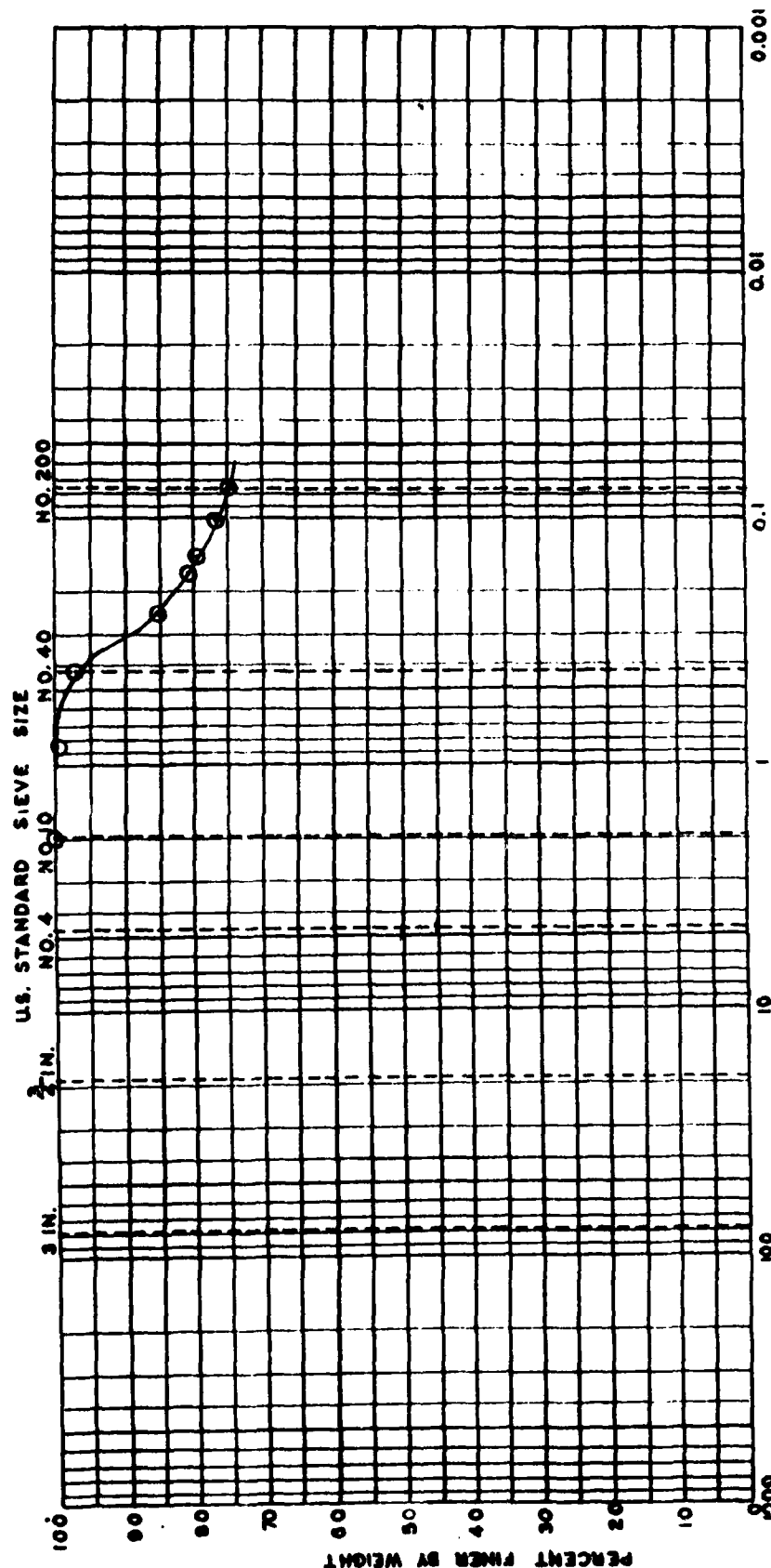
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 129 | 3009.0 | 97.1 |
| 130 | 3019.0 | 97.4 |
| 131 | 3029.0 | 97.5 |
| 132 | 3039.0 | 97.7 |
| 133 | 3049.0 | 98.0 |
| 134 | 3059.0 | 98.1 |
| 135 | 3069.0 | 98.3 |
| 136 | 3079.0 | 98.6 |
| 137 | 3089.0 | 99.0 |
| 138 | 3095.0 | 100.0 |
| B | 3128.8 | 102.0 |

EAST CELL DOCK CROSS-SECTION

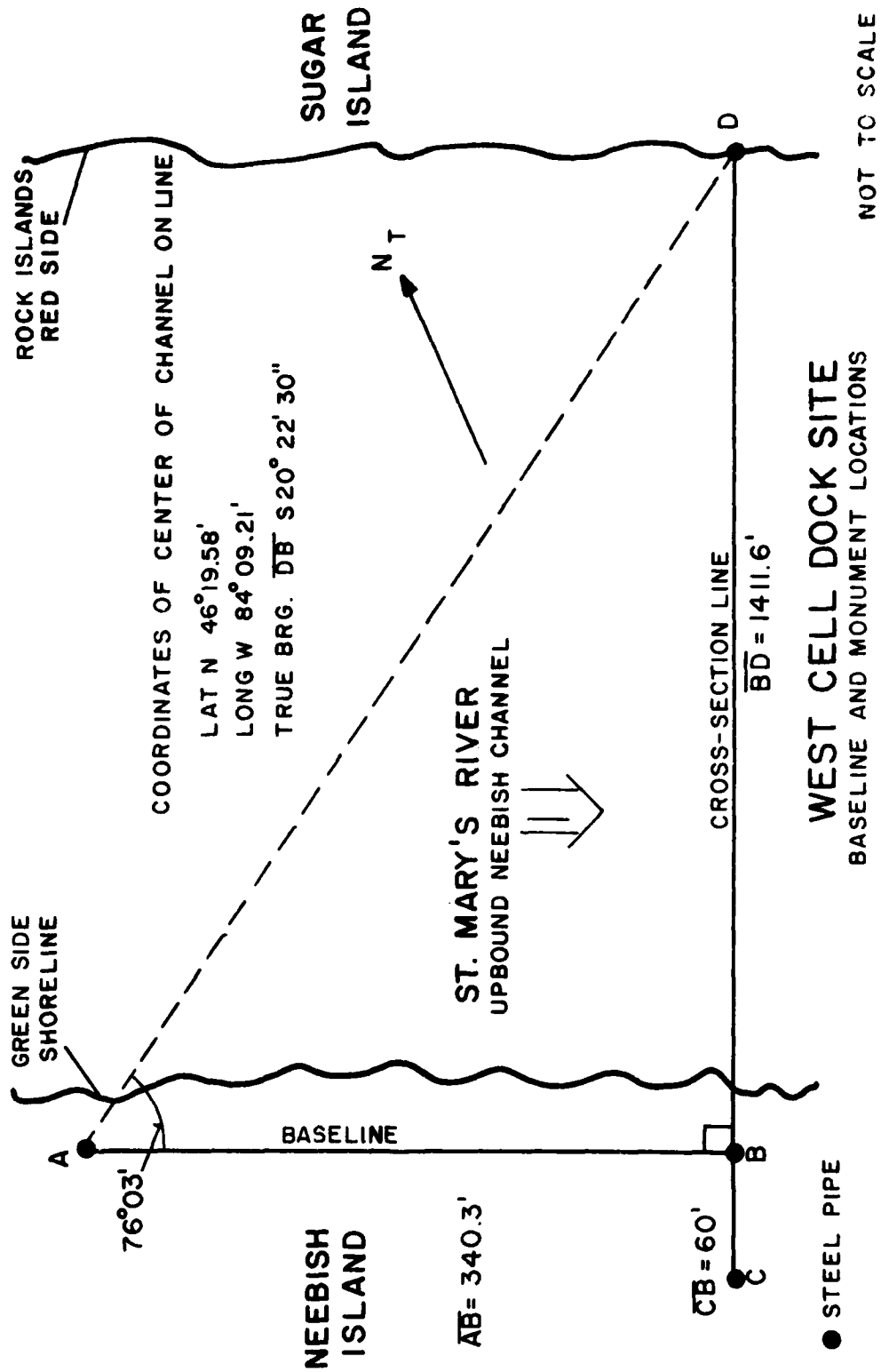
SOUNDED NOVEMBER 7, 1984







WEST CELL DOCK



XX
SOUNDING DATA

NAME OF SECTION WEST CELL DOCK
XX

DATE OF SOUNDING NOVEMBER 7, 1984

WATER SURFACE ELEVATION in feet = 100.0

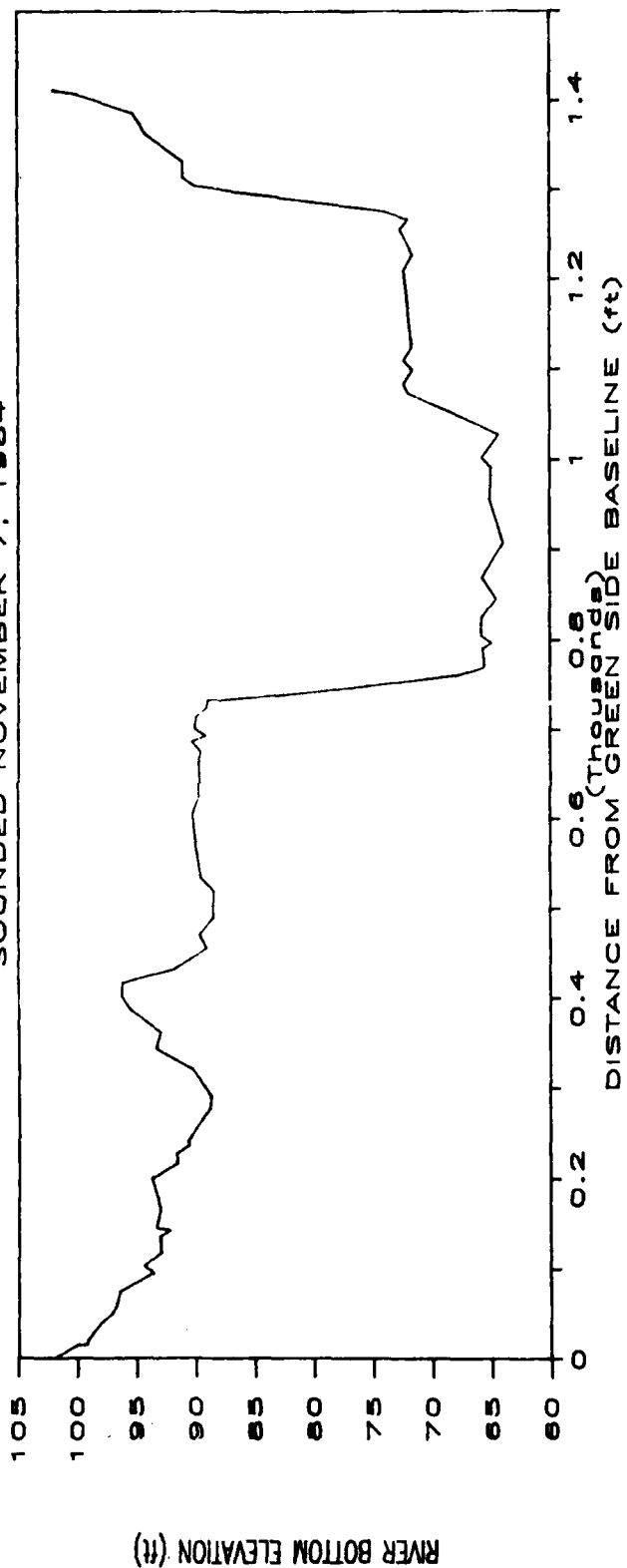
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| B | 0.0 | 102.0 |
| 2 | 15.0 | 100.0 |
| 3 | 15.5 | 99.2 |
| 4 | 20.0 | 99.1 |
| 5 | 30.0 | 98.6 |
| 6 | 40.0 | 98.0 |
| 7 | 50.0 | 97.1 |
| 8 | 60.0 | 96.7 |
| 9 | 75.0 | 96.4 |
| 10 | 95.0 | 93.6 |
| 11 | 103.0 | 94.4 |
| 12 | 118.0 | 93.0 |
| 13 | 136.0 | 93.1 |
| 14 | 143.0 | 92.2 |
| 15 | 146.0 | 93.4 |
| 16 | 166.0 | 93.0 |
| 17 | 200.0 | 93.8 |
| 18 | 218.0 | 91.6 |
| 19 | 228.0 | 91.7 |
| 20 | 238.0 | 90.6 |
| 21 | 243.0 | 90.7 |
| 22 | 279.0 | 88.8 |
| 23 | 292.0 | 88.7 |
| 24 | 322.0 | 90.3 |
| 25 | 345.0 | 93.4 |
| 26 | 363.0 | 93.0 |
| 27 | 388.0 | 95.6 |
| 28 | 403.0 | 96.3 |
| 29 | 418.0 | 96.2 |
| 30 | 433.0 | 91.8 |
| 31 | 456.0 | 89.1 |
| 32 | 471.0 | 89.7 |
| 33 | 490.0 | 88.5 |
| 34 | 519.0 | 88.5 |
| 35 | 535.0 | 89.6 |
| 36 | 578.0 | 90.1 |
| 37 | 605.0 | 90.3 |
| 38 | 625.0 | 89.7 |
| 39 | 661.0 | 89.8 |
| 40 | 675.0 | 89.6 |

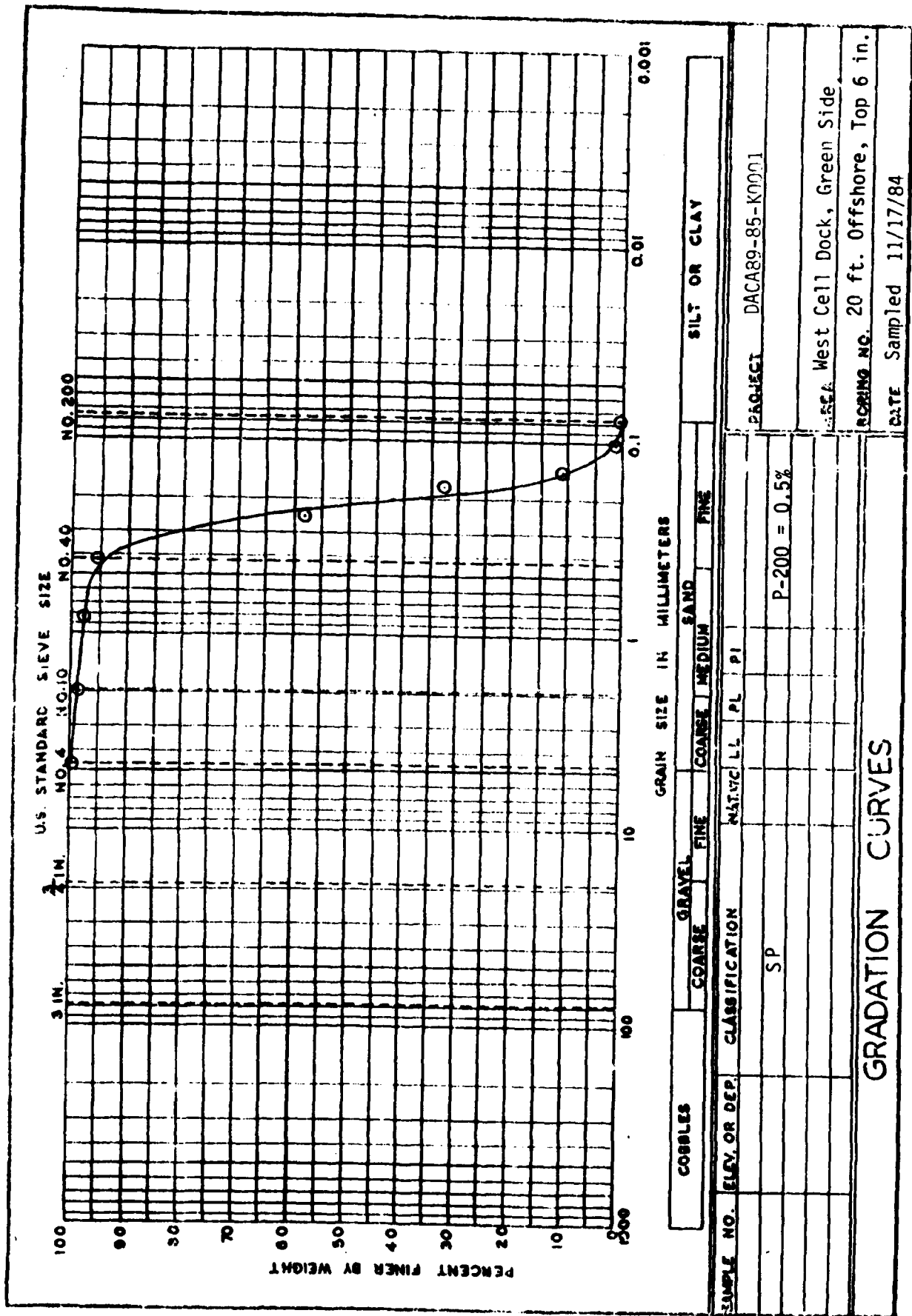
SOUNDRNG DATA (continued)

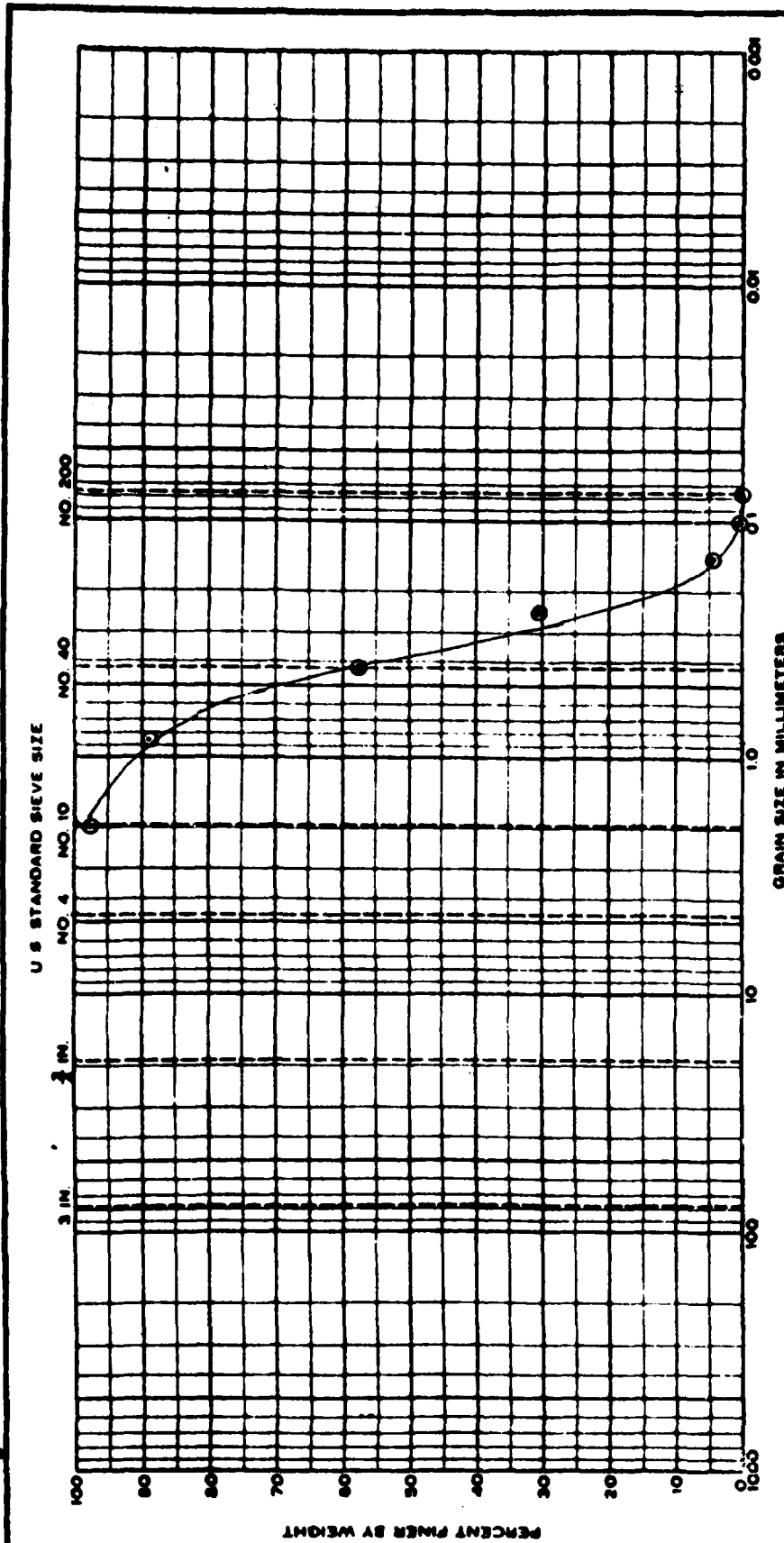
NAME OF SECTION WEST CELL DOCK

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 41 | 687.0 | 90.4 |
| 42 | 693.0 | 89.2 |
| 43 | 701.0 | 90.1 |
| 44 | 714.0 | 90.0 |
| 45 | 724.0 | 89.1 |
| 46 | 732.0 | 89.0 |
| 47 | 743.0 | 79.0 |
| 48 | 760.0 | 68.0 |
| 49 | 769.0 | 65.6 |
| 50 | 790.0 | 65.8 |
| 51 | 796.0 | 65.0 |
| 52 | 804.0 | 65.9 |
| 53 | 825.0 | 65.8 |
| 54 | 845.0 | 64.6 |
| 55 | 869.0 | 65.8 |
| 56 | 907.0 | 64.0 |
| 57 | 955.0 | 65.1 |
| 58 | 991.0 | 65.0 |
| 59 | 1002.0 | 65.8 |
| 60 | 1028.0 | 64.3 |
| 61 | 1074.0 | 72.0 |
| 62 | 1084.0 | 72.4 |
| 63 | 1099.0 | 71.6 |
| 64 | 1110.0 | 72.4 |
| 65 | 1124.0 | 71.7 |
| 66 | 1210.0 | 72.4 |
| 67 | 1227.0 | 71.6 |
| 68 | 1256.0 | 72.7 |
| 69 | 1267.0 | 72.0 |
| 70 | 1276.0 | 74.0 |
| 71 | 1305.0 | 90.1 |
| 72 | 1315.0 | 91.1 |
| 73 | 1332.0 | 91.1 |
| 74 | 1362.0 | 94.2 |
| 75 | 1386.0 | 95.3 |
| 76 | 1407.0 | 100.0 |
| D | 1411.6 | 102.0 |

WEST CELL DOCK CROSS-SECTION
SOUNDED NOVEMBER 7, 1984





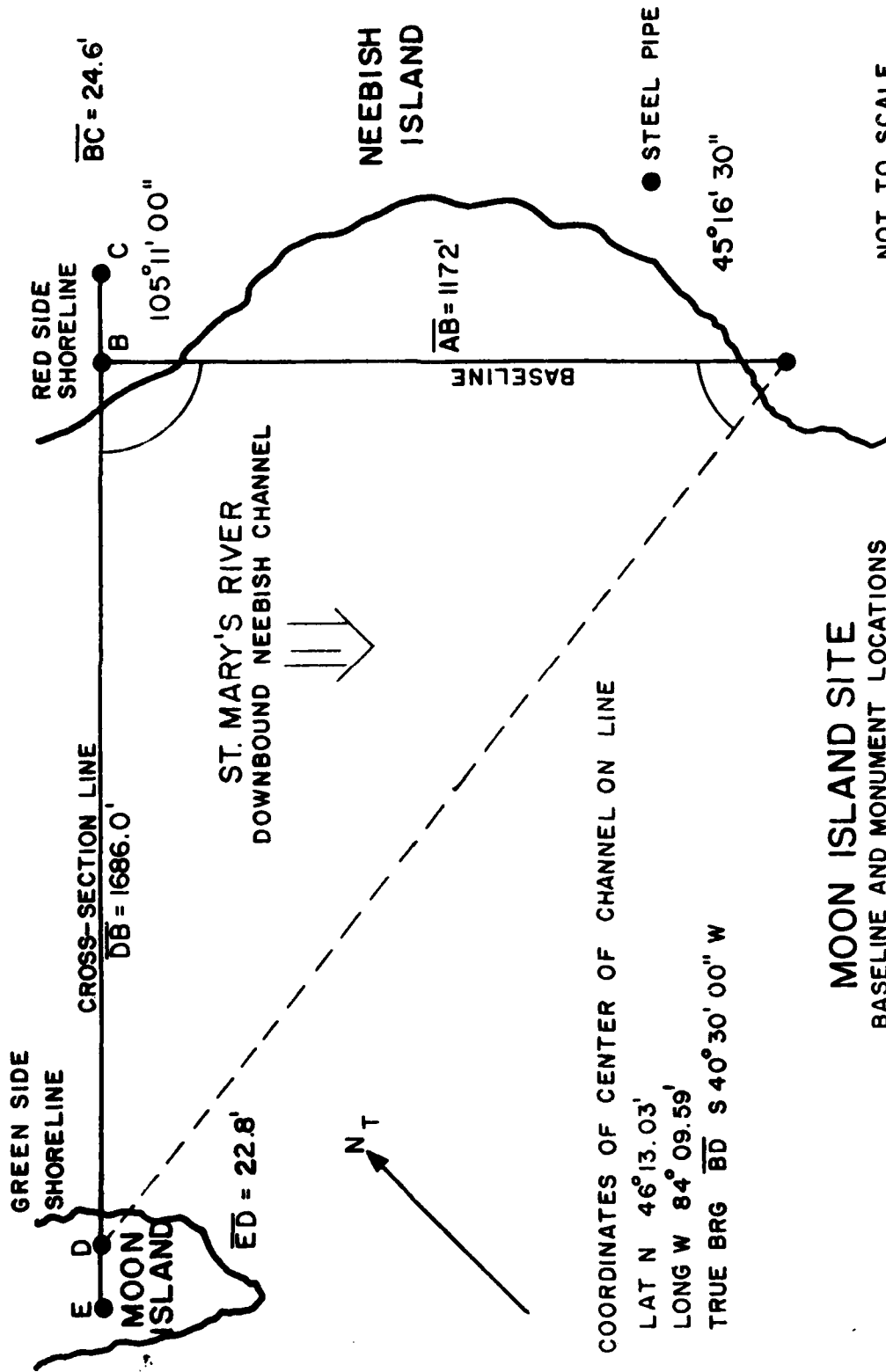


| COARSE | | FINE | | SAND | | SILT & CLAY | |
|--------|--------|------|--------|------|--------|-------------|-----|
| Gravel | Coarse | Fine | Coarse | Fine | Medium | Fin | Fin |

| | | | | | | | | |
|------------|---------------|----------------|--------|----|----|----|------------|----------------------------|
| Sample No. | Elev or Depth | Classification | Net WC | LL | PL | PI | Project | DACA89-85-K-0001 |
| | | SP | | | | | Area | West Cell Dock, Green Side |
| | | | | | | | Boring No. | Trap Facing Upstream |
| | | | | | | | Date | Nanticoke 6/28/85 |

GRADATION CURVES

MOON ISLAND



XX
SOUNDING DATA

NAME OF SECTION MOON ISLAND
XX

DATE OF SOUNDING NOVEMBER 7, 1984

WATER SURFACE ELEVATION in feet = 100.0

| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| D | 0.0 | 102.0 |
| 2 | 13.0 | 102.0 |
| 3 | 17.0 | 99.8 |
| 4 | 24.0 | 99.6 |
| 5 | 34.0 | 99.2 |
| 6 | 44.0 | 99.0 |
| 7 | 54.0 | 98.8 |
| 8 | 70.0 | 98.2 |
| 9 | 83.0 | 97.8 |
| 10 | 92.0 | 97.7 |
| 11 | 100.0 | 97.7 |
| 12 | 148.0 | 96.4 |
| 13 | 200.0 | 94.2 |
| 14 | 253.0 | 92.6 |
| 15 | 270.0 | 92.2 |
| 16 | 287.0 | 91.0 |
| 17 | 300.0 | 92.0 |
| 18 | 307.0 | 93.8 |
| 19 | 350.0 | 93.7 |
| 20 | 364.0 | 91.3 |
| 21 | 373.0 | 90.7 |
| 22 | 392.0 | 91.9 |
| 23 | 416.0 | 91.9 |
| 24 | 426.0 | 92.7 |
| 25 | 429.0 | 92.3 |
| 26 | 448.0 | 92.4 |
| 27 | 459.0 | 92.3 |
| 28 | 464.0 | 93.1 |
| 29 | 512.0 | 93.3 |
| 30 | 517.0 | 94.5 |
| 31 | 554.0 | 93.7 |
| 32 | 583.0 | 92.5 |
| 33 | 672.0 | 92.2 |
| 34 | 677.0 | 90.2 |
| 35 | 680.0 | 87.5 |
| 36 | 697.0 | 85.6 |
| 37 | 753.0 | 76.7 |
| 38 | 803.0 | 68.0 |
| 39 | 816.0 | 67.7 |
| 40 | 834.0 | 65.4 |

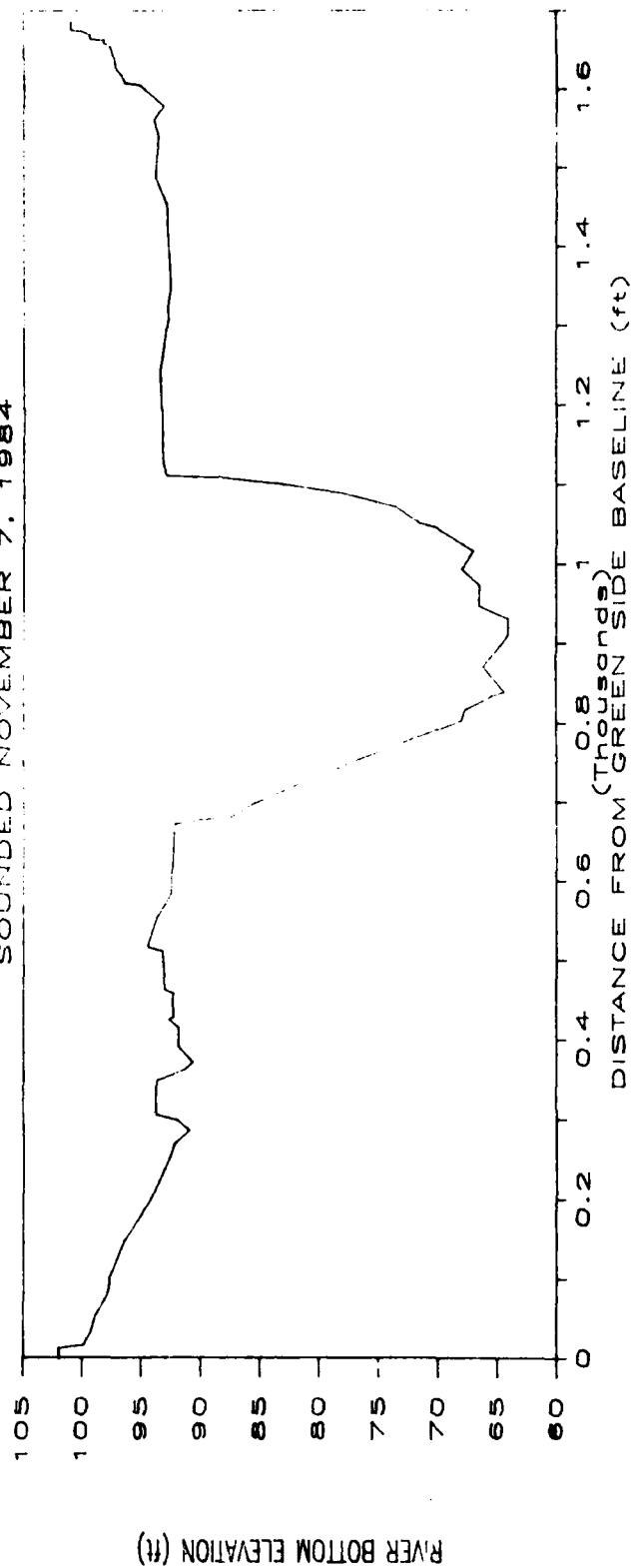
SOUNDRING DATA (continued)

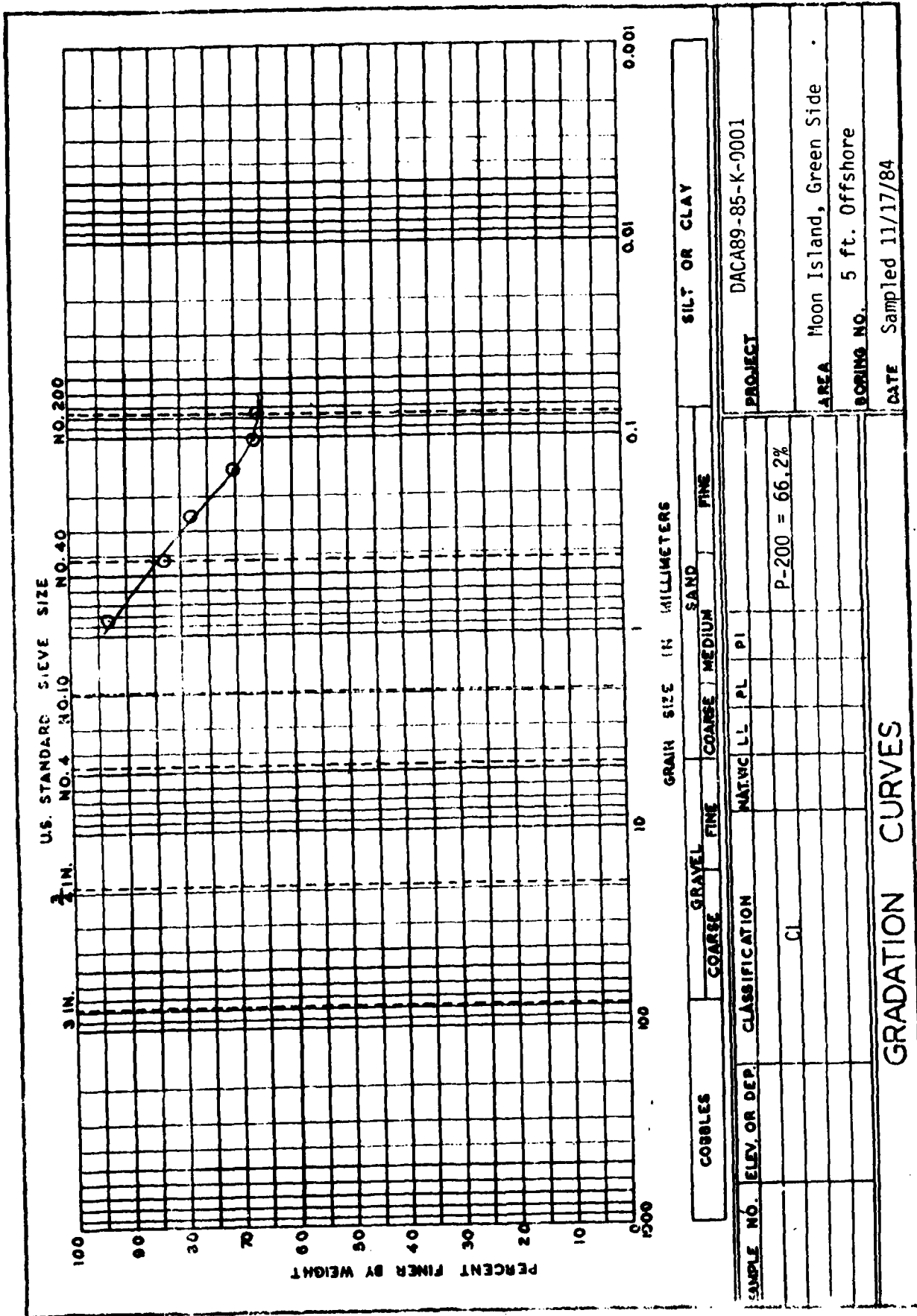
NAME OF SECTION MOON ISLAND

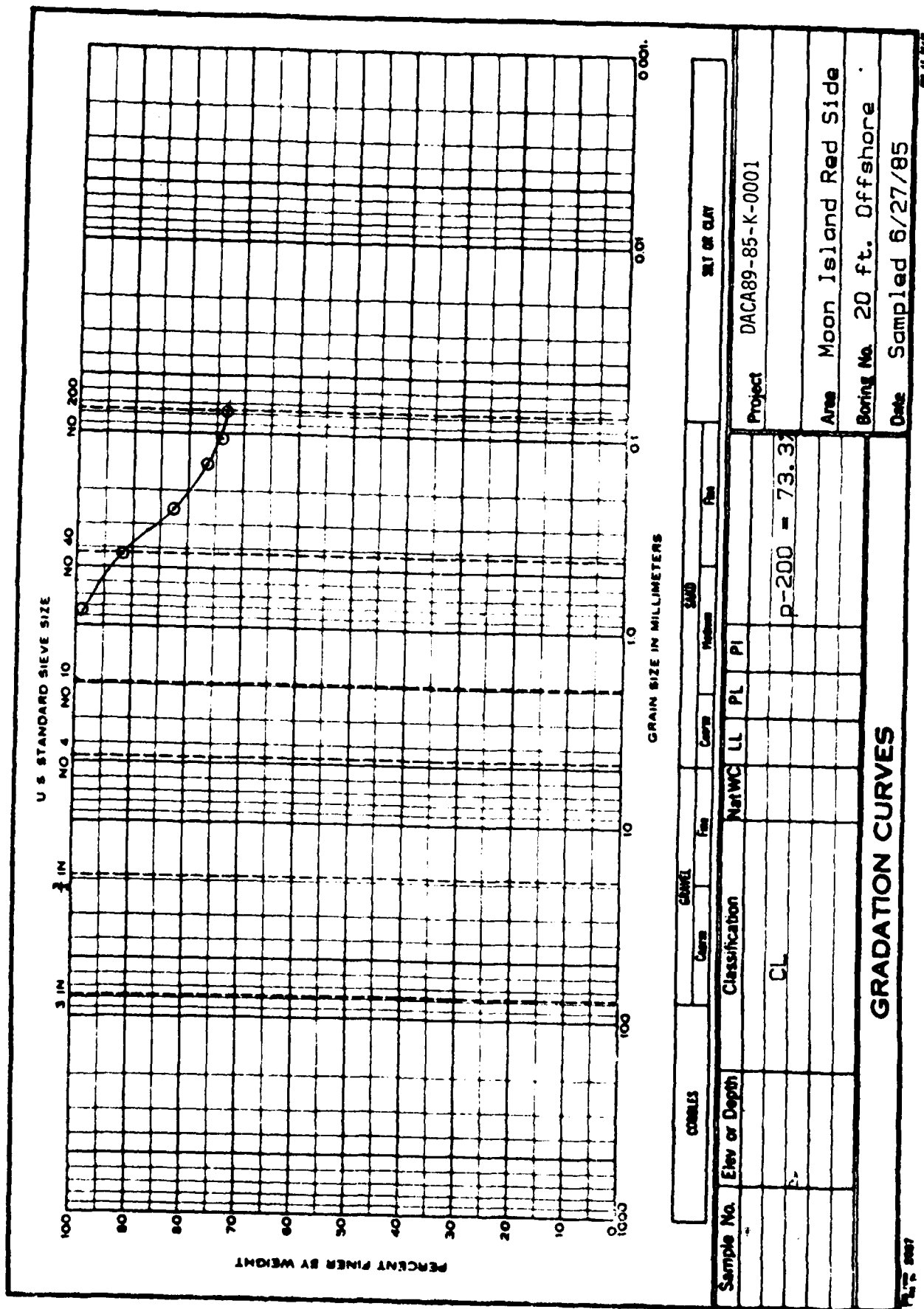
| DATA POINT | DISTANCE(ft) | ELEVATION(ft) |
|------------|--------------|---------------|
| 41 | 839.0 | 64.4 |
| 42 | 871.0 | 66.2 |
| 43 | 910.0 | 64.1 |
| 44 | 931.0 | 64.1 |
| 45 | 948.0 | 66.6 |
| 46 | 973.0 | 66.5 |
| 47 | 994.0 | 68.0 |
| 48 | 1017.0 | 67.0 |
| 49 | 1046.0 | 70.2 |
| 50 | 1052.0 | 71.6 |
| 51 | 1072.0 | 73.6 |
| 52 | 1090.0 | 78.0 |
| 53 | 1102.0 | 83.4 |
| 54 | 1110.0 | 88.5 |
| 55 | 1113.0 | 93.0 |
| 56 | 1130.0 | 93.3 |
| 57 | 1241.0 | 93.5 |
| 58 | 1311.0 | 92.8 |
| 59 | 1322.0 | 92.9 |
| 60 | 1347.0 | 92.6 |
| 61 | 1454.0 | 93.0 |
| 62 | 1488.0 | 93.9 |
| 63 | 1540.0 | 93.6 |
| 64 | 1561.0 | 94.0 |
| 65 | 1580.0 | 93.2 |
| 66 | 1606.0 | 95.2 |
| 67 | 1609.0 | 96.5 |
| 68 | 1619.0 | 96.8 |
| 69 | 1629.0 | 97.3 |
| 70 | 1639.0 | 97.4 |
| 71 | 1649.0 | 97.6 |
| 72 | 1654.0 | 97.7 |
| 73 | 1659.0 | 98.2 |
| 74 | 1663.0 | 98.2 |
| 75 | 1664.0 | 99.4 |
| 76 | 1669.0 | 99.4 |
| 77 | 1674.0 | 100.0 |
| 78 | 1675.0 | 101.0 |
| B | 1686.0 | 101.0 |

MOON ISLAND CROSS-SECTION

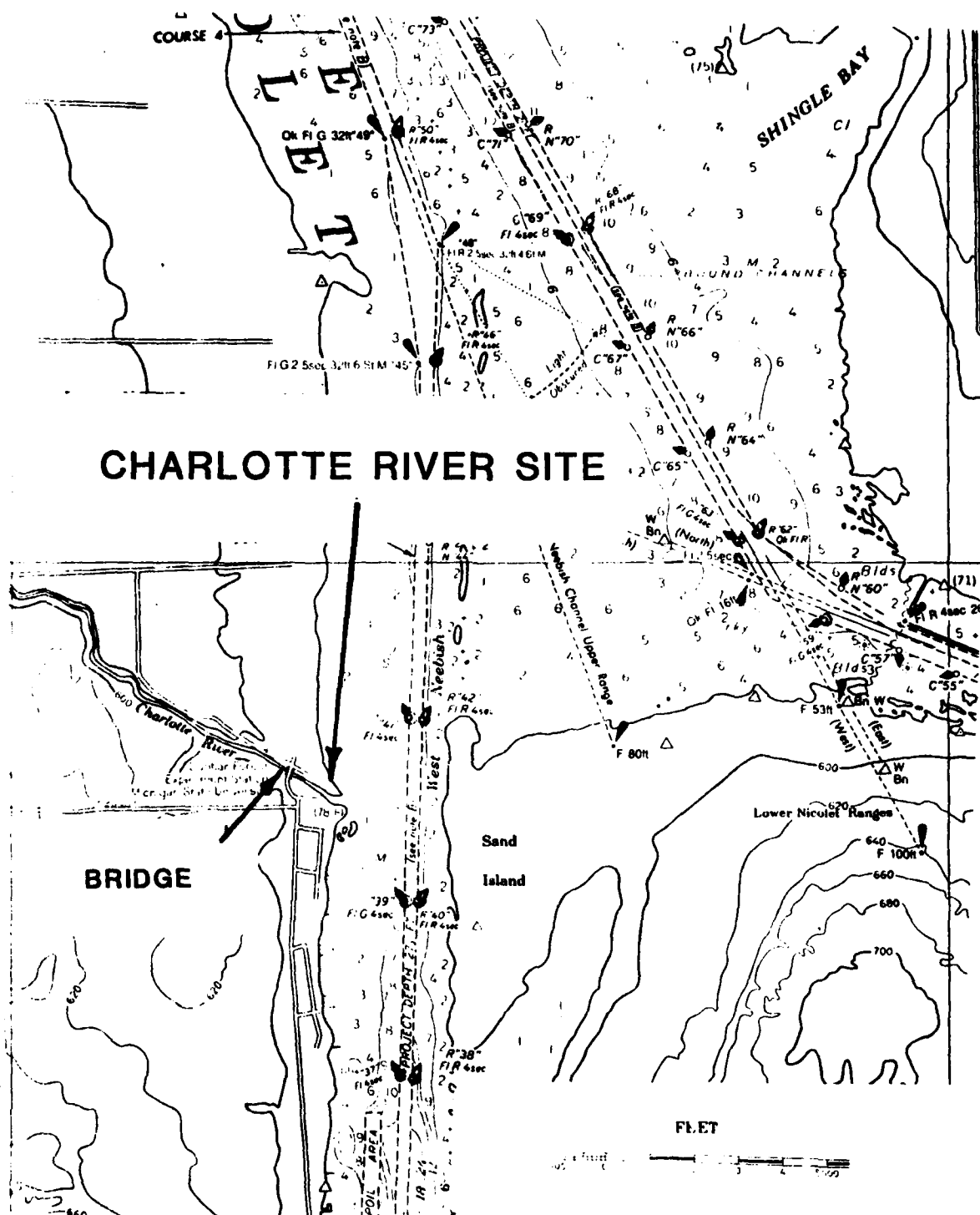
SOUNDED NOVEMBER 7, 1984







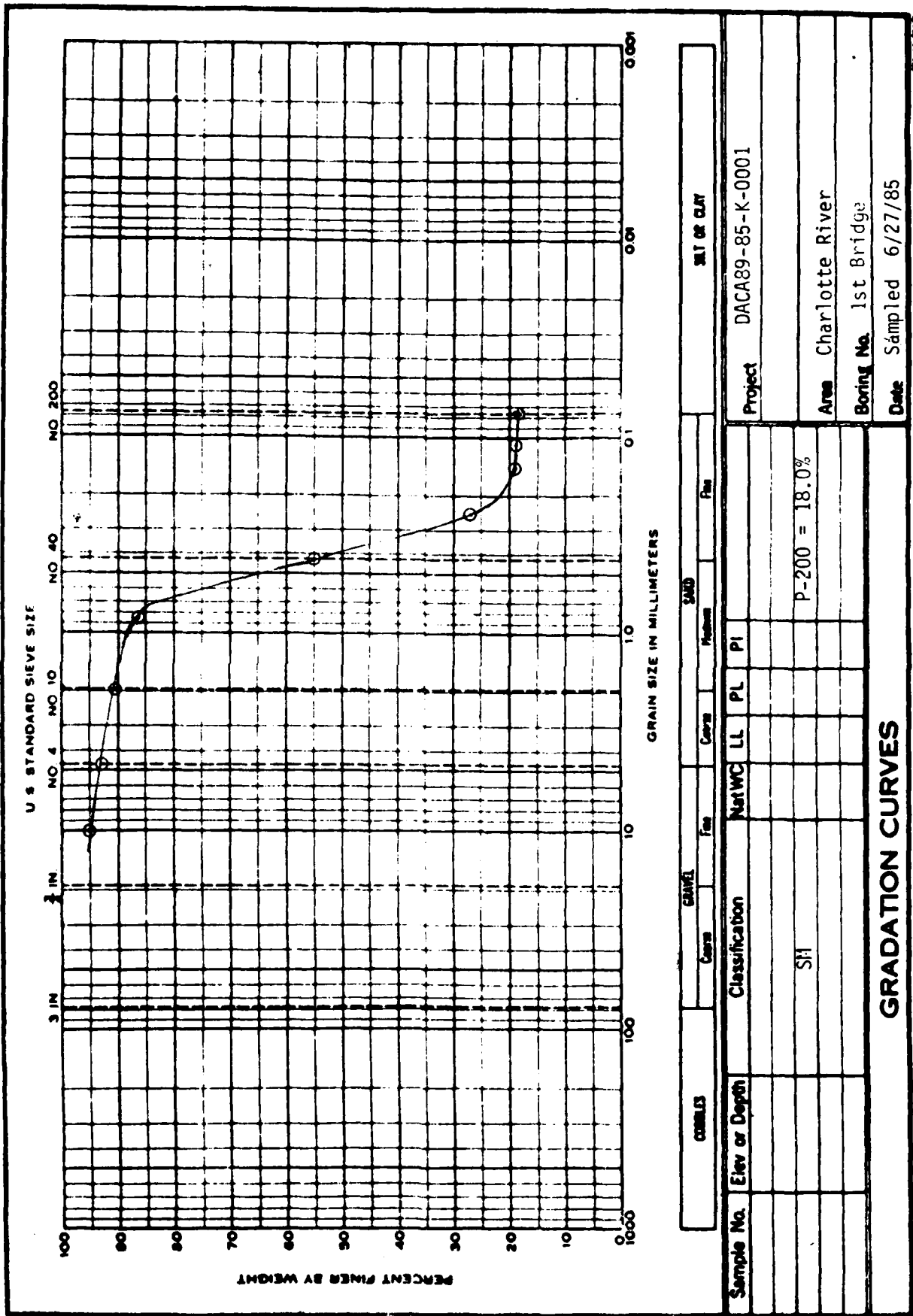
CHARLOTTE RIVER

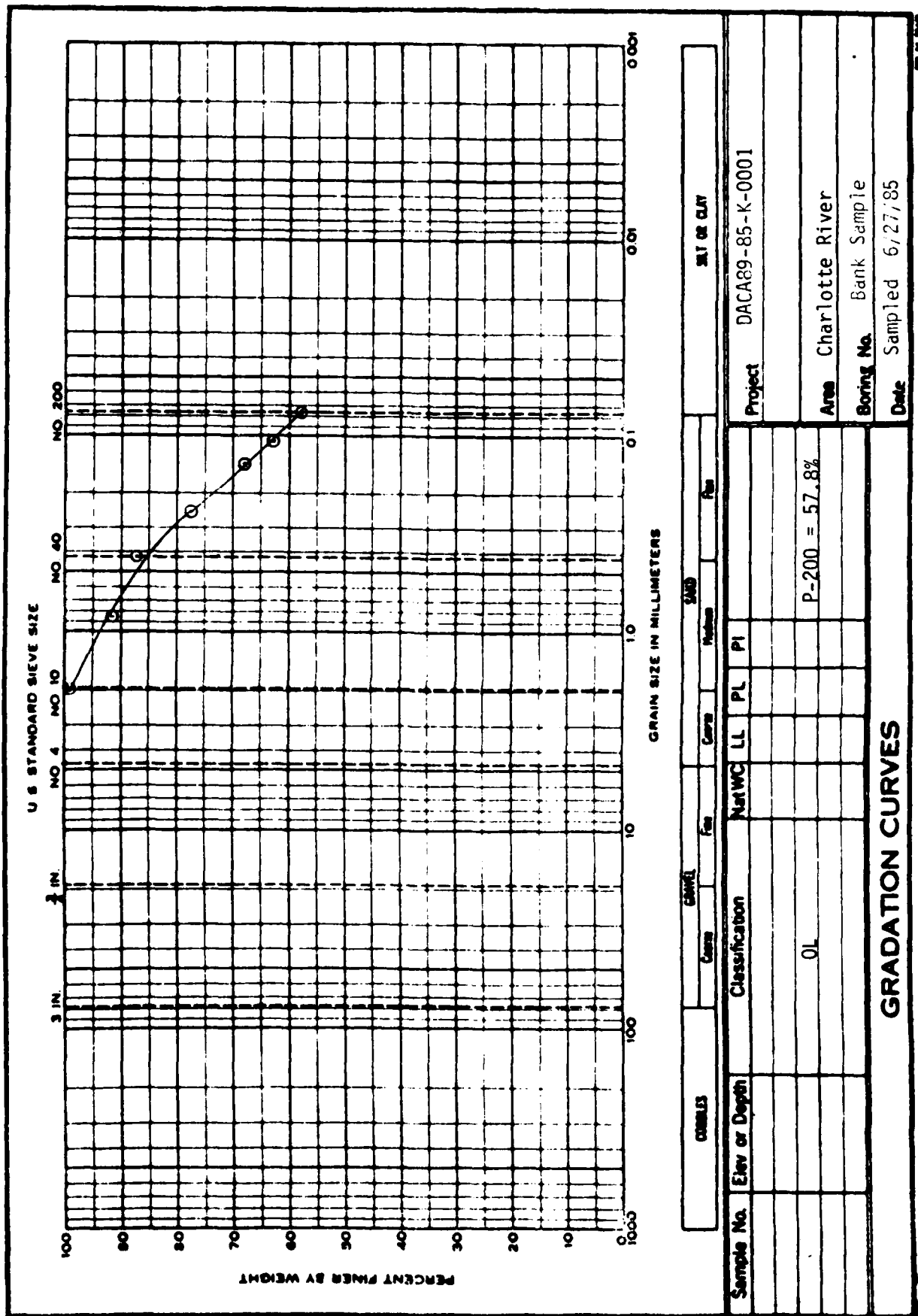


SITE LOCATION

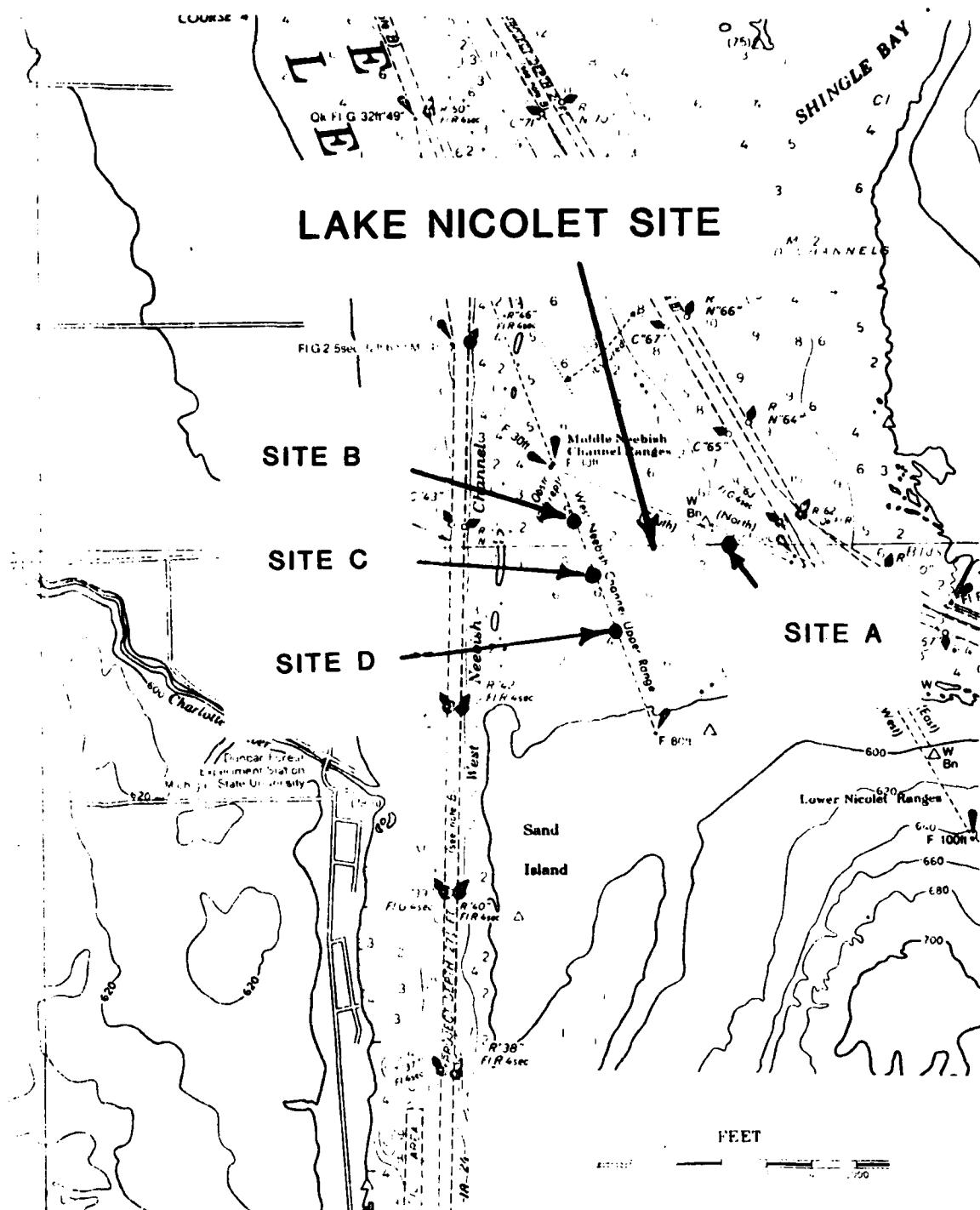
CHARLOTTE RIVER

AH1





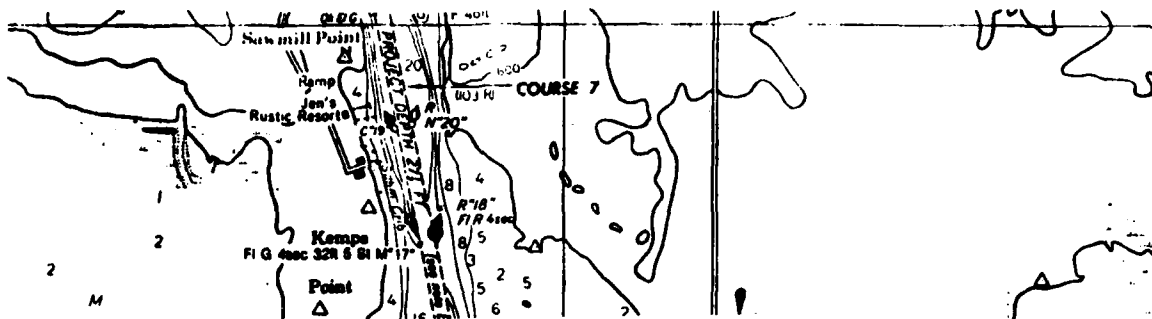
LAKE NICOLET



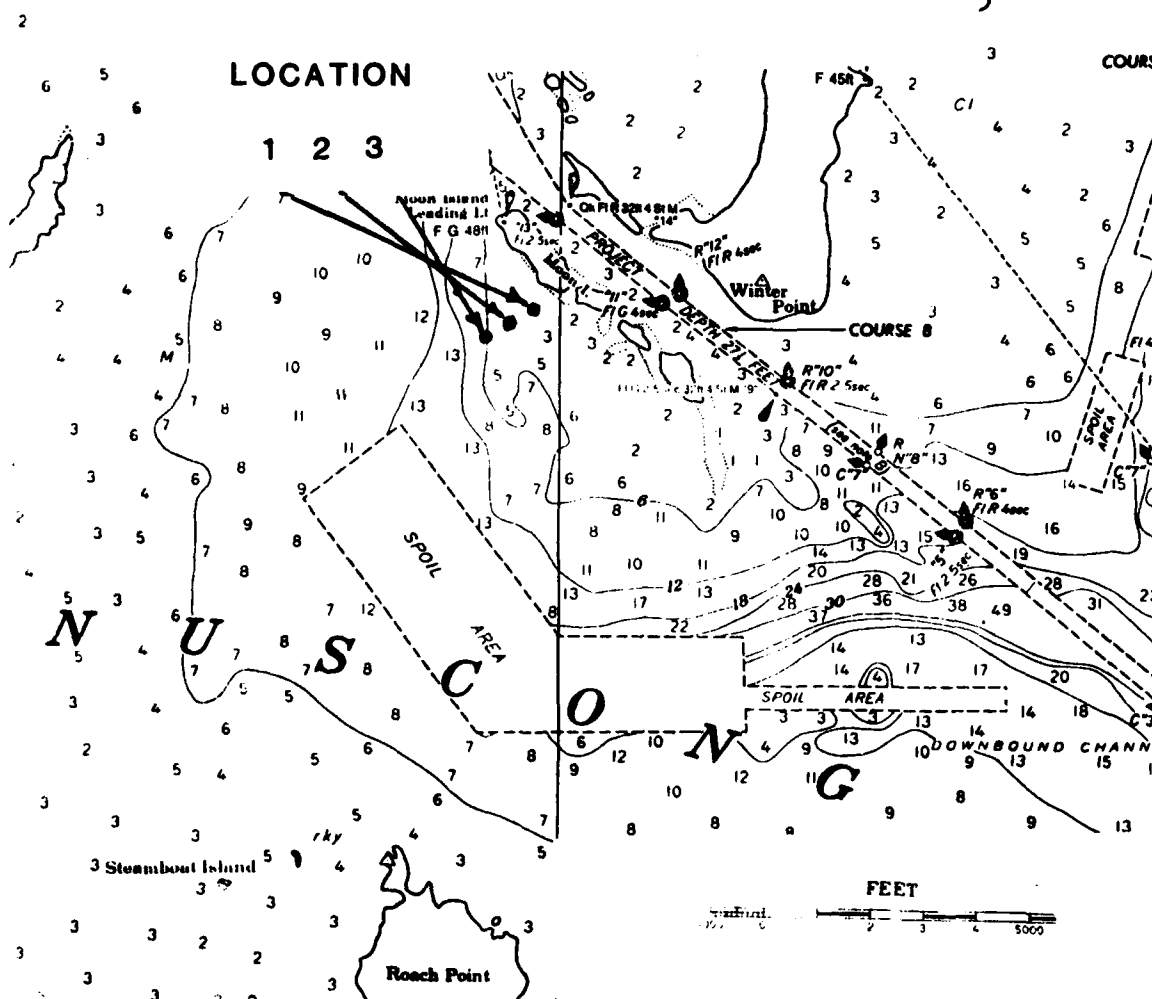
SITE LOCATION

LAKE NICOLET

LAKE MUNUSCONG



LAKE MUNUSCONG SITE



SITE LOCATION

LAKE MUNUSCONG